

**Scientific and Technical
Aerospace Reports**

STAR

**Volume 39
October 5, 2001**



National Aeronautics and
Space Administration
Langley Research Center

**Scientific and Technical
Information Program Office**

The NASA STI Program Office . . . in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the lead center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- Access the NASA STI Program Home Page at <http://www.sti.nasa.gov>
- E-mail your question via the Internet to help@sti.nasa.gov
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Telephone the NASA STI Help Desk at (301) 621-0390
- Write to:
NASA STI Help Desk
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (STAR) is an electronic abstract journal, listing citations with abstracts for aerospace-related reports obtained from worldwide sources. It is electronically published biweekly and announces documents that have recently been entered into the NASA Scientific and Technical Information (STI) Database. The documents are of the following types:

- NASA, NASA contractor, and NASA grantee reports;
- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms;
- Translations in report form;
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses.

Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

Abstracts in *STAR* are categorized by 10 major subject divisions that are divided further into 76 specific subject categories. The subject divisions and categories are listed in the Table of Contents together with a note for each that defines its scope and provides any cross-references.

SCAN Goes Electronic!

If you have electronic mail or if you can access the Internet, you can view biweekly issues of *SCAN* from your desktop absolutely free!

Electronic SCAN takes advantage of computer technology to inform you of the latest worldwide, aerospace-related, scientific and technical information that has been published.

No more waiting while the paper copy is printed and mailed to you. You can view *Electronic SCAN* the same day it is released—up to 191 topics to browse at your leisure. When you locate a publication of interest, you can print the announcement. You can also go back to the *Electronic SCAN* home page and follow the ordering instructions to quickly receive the full document.

Start your access to *Electronic SCAN* today. Over 1,000 announcements of new reports, books, conference proceedings, journal articles...and more—available to your computer every two weeks.

**Timely
Flexible
Complete
FREE!**

For Internet access to *E-SCAN*, use any of the following addresses:

<http://www.sti.nasa.gov>

[ftp.sti.nasa.gov](ftp://sti.nasa.gov)

gopher.sti.nasa.gov

Determine the *SCAN* topics you wish to receive and send an e-mail to **listserv@sti.nasa.gov**. Leave the subject line blank and enter a subscribe command, denoting which topic you want and your name in the message area, formatted as follows:

Subscribe SCAN-02-01 Jane Doe

For additional information, e-mail a message to **help@sti.nasa.gov**.

Phone: (301) 621-0390

Fax: (301) 621-0134

Write: NASA STI Help Desk
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

Looking just for *Aerospace Medicine and Biology* reports?

Although hard copy distribution has been discontinued, you can still receive these vital announcements through your *E-SCAN* subscription. Just **Subscribe SCAN-AEROMED Jane Doe** in the message area of your e-mail to **listserv@sti.nasa.gov**.



Table of Contents

Subject Divisions

Document citations are grouped first by the following divisions. Select a division title to view the category-level Table of Contents.

A. Aeronautics

B. Astronautics

C. Chemistry and Materials

D. Engineering

E. Geosciences

F. Life Sciences

G. Mathematical and Computer Sciences

H. Physics

I. Social and Information Sciences

J. Space Sciences

K. General

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for searching on *NASA Thesaurus* subject terms and personal author names.

Subject Term Index

Personal Author Index

Document Availability

Select **Availability Info** for important information about NASA Scientific and Technical Information (STI) Program Office products and services, including registration with the NASA Center for Aerospace Information (CASI) for access to the NASA CASI TRS (Technical Report Server), and availability and pricing information for cited documents.

Subject Categories of the Division A. Aeronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- 01 Aeronautics (General) 1**
Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see *categories 02 through 09*. For information related to space vehicles see *12 Astronautics*.
- 02 Aerodynamics 1**
Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbo-machinery. For related information, see also *34 Fluid Mechanics and Heat Transfer*.
- 03 Air Transportation and Safety 3**
Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety*; and *85 Technology Utilization and Surface Transportation*.
- 04 Aircraft Communications and Navigation 5**
Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation*; *17 Space Communications*; *Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar*.
- 05 Aircraft Design, Testing and Performance 6**
Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Technology Utilization and Surface Transportation*.
- 07 Aircraft Propulsion and Power 9**
Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.
- 08 Aircraft Stability and Control 10**
Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

09 Research and Support Facilities (Air) 10

Includes airports, runways, hangars, and aircraft repair and overhaul facilities, wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operation see *03 Air Transportation and Safety*. For astronomical facilities see *14 Ground Support Systems and Facilities (Space)*.

Subject Categories of the Division B. Astronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

12 Astronautics (General) 13

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration, see *91 Lunar and Planetary Science and Exploration*.

13 Astrodynamics 15

Includes powered and free-flight trajectories; and orbital and launching dynamics.

14 Ground Support Systems and Facilities (Space) 22

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air)*.

15 Launch Vehicles and Launch Operations 23

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing, and Performance*; and *20 Spacecraft Propulsion and Power*.

16 Space Transportation and Safety 27

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also *03 Air Transportation and Safety* and *15 Launch Vehicles and Launch Vehicles*, and *18 Spacecraft Design, Testing and Performance*. For space suits, see *54 Man/System Technology and Life Support*.

17 Space Communications, Spacecraft Communications, Command and Tracking 28

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar*.

18 **Spacecraft Design, Testing and Performance** 28

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see *54 Man/System Technology and Life Support*. For related information, see also *05 Aircraft Design, Testing and Performance*, *39 Structural Mechanics*, and *16 Space Transportation and Safety*.

19 **Spacecraft Instrumentation and Astrionics** 33

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also *06 Aircraft Instrumentation and Avionics*; For spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy, Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20 Spacecraft Propulsion and Power 35

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also *07 Aircraft Propulsion and Power*; *28 Propellants and Fuels*; *15 Launch Vehicles and Launch Operations*; and *44 Energy Production and Conversion*.

Subject Categories of the Division C. Chemistry and Materials

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

23 Chemistry and Materials (General) 37

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 24 through 29*. For astrochemistry see category *90 Astrophysics*.

24 Composite Materials 39

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

25 Inorganic, Organic, and Physical Chemistry 42

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also *34 Fluid Dynamics and Thermodynamics*, For astrochemistry see category *90 Astrophysics*.

26 Metals and Metallic Materials 47

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

- 27 Nonmetallic Materials 49**
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.
- 28 Propellants and Fuels 53**
Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.
- 29 Space Processing 54**
Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

Subject Categories of the Division D. Engineering

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- 31 Engineering (General) 56**
Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.
- 32 Communications and Radar 58**
Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also *04 Aircraft Communications and Navigation*; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue see *03 Air Transportation and Safety*, and *16 Space Transportation and Safety*.
- 33 Electronics and Electrical Engineering 64**
Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.
- 34 Fluid Mechanics and Thermodynamics 70**
Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

- 35 Instrumentation and Photography 74**
Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation*.
- 36 Lasers and Masers 79**
Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.
- 37 Mechanical Engineering 80**
Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.
- 39 Structural Mechanics 82**
Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

Subject Categories of the Division E. Geosciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- 42 Geosciences (General) 84**
Includes general research topics related to the Earth sciences, and the specific areas of petrology, minerology, and general geology. For other specific topics in geosciences see *categories 42 through 48*.
- 43 Earth Resources and Remote Sensing 87**
Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see *35 Instrumentation and Photography*.

- | | | |
|-----------|---|------------|
| 44 | Energy Production and Conversion | 91 |
| | Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see <i>73 Nuclear Physics</i> . For related information see also <i>07 Aircraft Propulsion and Power</i> ; <i>20 Spacecraft Propulsion and Power</i> , and <i>28 Propellants and Fuels</i> . | |
| 45 | Environment Pollution | 97 |
| | Includes atmospheric, water, soil, noise, and thermal pollution. | |
| 46 | Geophysics | 107 |
| | Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see <i>47 Meteorology and Climatology</i> ; and <i>93 Space Radiation</i> . | |
| 47 | Meteorology and Climatology | 116 |
| | Includes weather observation forecasting and modification. | |
| 48 | Oceanography | 127 |
| | Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also <i>43 Earth Resources and Remote Sensing</i> . | |

Subject Categories of the Division F. Life Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- | | | |
|-----------|---|------------|
| 51 | Life Sciences (General) | 128 |
| | Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see <i>categories 52 through 55</i> . | |
| 52 | Aerospace Medicine | 141 |
| | Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see <i>53 Behavioral Sciences</i> . For the effects of space on animals and plants see <i>51 Life Sciences</i> . | |
| 53 | Behavioral Sciences | 157 |
| | Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research. | |
| 54 | Man/System Technology and Life Support | 159 |
| | Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also <i>16 Space Transportation</i> and <i>52 Aerospace Medicine</i> . | |

55 Exobiology 165

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Science*.

Subject Categories of the Division G. Mathematical and Computer Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

59 Mathematical and Computer Sciences (General) 166

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

60 Computer Operations and Hardware 166

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

61 Computer Programming and Software 167

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

62 Computer Systems 175

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

63 Cybernetics, Artificial Intelligence and Robotics 179

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

64 Numerical Analysis 180

Includes iteration, differential and difference equations, and numerical approximation.

65 Statistics and Probability 184

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

66 Systems Analysis and Operations Research 185

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

67 Theoretical Mathematics 186

Includes algebra, functional analysis, geometry, topology set theory, group theory and number theory.

Subject Categories of the Division H. Physics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

70 Physics (General) 189

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics or solar physics see *46 Geophysics*, *90 Astrophysics*, or *92 Solar Physics*.

71 Acoustics 191

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion Propulsion and Power*.

72 Atomic and Molecular Physics 195

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

73 Nuclear Physics 199

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

74 Optics 202

Includes light phenomena and the theory of optical devices. For lasers see *36 Lasers and Masers*.

75 Plasma Physics 205

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 Solid-State Physics 208

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 Physics of Elementary Particles and Fields 214

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics*, *73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

Subject Categories of the Division I. Social and Information Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- | | | |
|-----------|--|------------|
| 80 | Social and Information Sciences (General) | 215 |
| | Includes general research topics related to sociology; educational programs and curricula. | |
| 81 | Administration and Management | 221 |
| | Includes management planning and research. | |
| 82 | Documentation and Information Science | 223 |
| | Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see <i>61 Computer Programming and Software</i> . | |
| 83 | Economics and Cost Analysis | 228 |
| | Includes cost effectiveness studies. | |
| 84 | Law, Political Science and Space Policy | 228 |
| | Includes aviation law; space law and policy; international law; international cooperation; and patent policy. | |
| 85 | Technology Utilization and Surface Transportation | 228 |
| | Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also <i>03 Air Transportation and Safety</i> , <i>16 Space Transportation and Safety</i> , and <i>44 Energy Production and Conversion</i> . For specific technology transfer applications see also the category where the subject is treated. | |

Subject Categories of the Division J. Space Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- | | | |
|-----------|---|------------|
| 88 | Space Sciences (General) | 229 |
| | Includes general research topics related to the natural space sciences. For specific topics in space sciences see <i>categories 89 through 93</i> . | |
| 89 | Astronomy | 230 |
| | Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry. | |

- 90 Astrophysics 235**
Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.
- 91 Lunar and Planetary Science and Exploration 243**
Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.
- 92 Solar Physics 248**
Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.
- 93 Space Radiation 250**
Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *52 Aerospace Medicine*. For theory see *73 Nuclear Physics*.

Subject Categories of the Division K. General

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- 99 General 251**
Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

Document Availability Information

The mission of the NASA Scientific and Technical (STI) Program Office is to quickly, efficiently, and cost-effectively provide the NASA community with desktop access to STI produced by NASA and the world's aerospace industry and academia. In addition, we will provide the aerospace industry, academia, and the taxpayer access to the intellectual scientific and technical output and achievements of NASA.

Eligibility and Registration for NASA STI Products and Services

The NASA STI Program offers a wide variety of products and services to achieve its mission. Your affiliation with NASA determines the level and type of services provided by the NASA STI Program. To assure that appropriate level of services are provided, NASA STI users are requested to register at the NASA Center for AeroSpace Information (CASI). Please contact NASA CASI in one of the following ways:

E-mail: help@sti.nasa.gov
Fax: 301-621-0134
Phone: 301-621-0390
Mail: ATTN: Registration Services
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

Limited Reproducibility

In the database citations, a note of limited reproducibility appears if there are factors affecting the reproducibility of more than 20 percent of the document. These factors include faint or broken type, color photographs, black and white photographs, foldouts, dot matrix print, or some other factor that limits the reproducibility of the document. This notation also appears on the microfiche header.

NASA Patents and Patent Applications

Patents owned by NASA are announced in the STI Database. Printed copies of patents (which are not microfiched) are available for purchase from the U.S. Patent and Trademark Office.

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the U.S. Patent and Trademark Office.

Patents and patent applications owned by NASA are available for licensing. Requests for licensing terms and further information should be addressed to:

National Aeronautics and Space Administration
Associate General Counsel for Intellectual Property
Code GP
Washington, DC 20546-0001

Sources for Documents

One or more sources from which a document announced in the STI Database is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, with an Addresses of Organizations list near the back of this section. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source.

Avail: NASA CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the citation. Current values are given in the NASA CASI Price Code Table near the end of this section.

Note on Ordering Documents: When ordering publications from NASA CASI, use the document ID number or other report number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in Energy Research Abstracts. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center—Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU International topic categories can be obtained from ESDU International.

Avail: Fachinformationszentrum Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 76344 Eggenstein-Leopoldshafen, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

- Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.
- Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.
- Avail: Univ. Microfilms. Documents so indicated are dissertations selected from Dissertation Abstracts and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.
- Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of \$1.50 each, postage free.
- Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.
- Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on the Addresses of Organizations page. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Addresses of Organizations

British Library Lending Division
Boston Spa, Wetherby, Yorkshire
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830

European Space Agency–
Information Retrieval Service ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

ESDU International
27 Corsham Street
London
N1 6UA
England

Fachinformationszentrum Karlsruhe
Gesellschaft für wissenschaftlich–technische
Information mbH
76344 Eggenstein–Leopoldshafen, Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

(NASA STI Lead Center)
National Aeronautics and Space Administration
Scientific and Technical Information Program Office
Langley Research Center – MS157
Hampton, VA 23681

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, CA 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, MI 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, VA 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, AZ 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, CO 80225

NASA CASI Price Tables — Effective January 1, 2001

Prices are subject to change without notice

<i>Hardcopy & Microfiche Prices</i>			
<i>Code</i>	<i>NASA</i>	<i>U.S.*</i>	<i>International*</i>
A01	\$9.50	\$9.50	\$19.00
A02	\$13.50	\$14.50	\$29.00
A03	\$24.50	\$27.50	\$55.00
A04	\$27.00	\$30.50	\$61.00
A05	\$28.50	\$32.50	\$65.00
A06	\$31.00	\$35.50	\$71.00
A07	\$34.50	\$39.50	\$79.00
A08	\$37.50	\$43.00	\$86.00
A09	\$42.50	\$49.00	\$98.00
A10	\$45.50	\$53.00	\$106.00
A11	\$48.50	\$56.50	\$113.00
A12	\$52.50	\$61.00	\$122.00
A13	\$55.50	\$65.00	\$130.00
A14	\$57.50	\$67.00	\$134.00
A15	\$59.50	\$69.50	\$139.00
A16	\$61.50	\$72.00	\$144.00
A17	\$63.50	\$74.50	\$149.00
A18	\$67.00	\$78.50	\$157.00
A19	\$69.00	\$81.00	\$162.00
A20	\$71.00	\$83.50	\$167.00
A21	\$73.00	\$86.00	\$172.00
A22	\$78.50	\$92.50	\$185.00
A23	\$80.50	\$95.00	\$190.00
A24	\$82.50	\$97.00	\$194.00
A25	\$84.50	\$99.50	\$199.00
A99	Contact NASA CASI		

<i>Exception Prices</i>			
<i>Code</i>	<i>NASA</i>	<i>U.S.*</i>	<i>International*</i>
E01	\$102.50	\$121.00	\$242.00
E02	\$111.00	\$131.50	\$263.00
E03	\$120.50	\$143.00	\$286.00
E04	\$130.00	\$154.00	\$308.00
E05	\$139.50	\$165.50	\$331.00
E06	\$148.00	\$176.00	\$352.00
E07	\$157.50	\$187.00	\$374.00
E08	\$167.00	\$198.50	\$397.00
E09	\$175.50	\$209.00	\$418.00
E10	\$185.00	\$220.00	\$440.00
E11	\$194.50	\$231.50	\$463.00
E12	\$202.50	\$241.00	\$482.00
E13	\$212.00	\$252.50	\$505.00
E14	\$221.50	\$264.00	\$528.00
E15	\$231.00	\$275.50	\$551.00
E16	\$239.50	\$285.50	\$571.00
E17	\$249.00	\$297.00	\$594.00
E18	\$258.50	\$308.50	\$617.00
E19	\$267.00	\$318.50	\$637.00
E20	\$276.50	\$330.00	\$660.00
E21	\$286.00	\$341.50	\$683.00
E22	\$294.50	\$351.50	\$703.00
E23	\$304.00	\$363.00	\$726.00
E24	\$313.50	\$374.50	\$749.00
E99	Free	Free	Free

NASA Prices:

For NASA libraries, NASA Employees
& NASA contractors registered at NASA CASI.

U.S. Prices:

For users within the U.S.

International Prices:

For users outside the U.S. and International
Embassies within the U.S.

Processing

Standard N/A

(most orders are processed within
three (3) business days, then shipped)

Rush

\$10.00 per item

(orders are processed within
one (1) business day, then shipped)

Shipping & Handling Fees: per item

Standard (USPS Priority)

\$2.00 U.S.

(delivered within 2-3 business days)

\$7.00 International

(delivered within 4-7 business days)

USPS Express (U.S. only)

\$13.00

(1-day delivery service to most destinations)

Fax (Up to 30 pages,

\$16.50 U.S.

\$24.00 International

Federal Express

User's Account Only _____

Federal Depository Library Program

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the Federal Regional Depository Libraries, arranged alphabetically by state, appears at the very end of this section. These libraries are not sales outlets. A local library can contact a regional depository to help locate specific reports, or direct contact may be made by an individual.

Public Collection of NASA Documents

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in the STI Database. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents FIZ–Fachinformation Karlsruhe–Bibliographic Service, D-76344 Eggenstein-Leopoldshafen, Germany and TIB–Technische Informationsbibliothek, P.O. Box 60 80, D-30080 Hannover, Germany.

Submitting Documents

All users of this abstract service are urged to forward reports to be considered for announcement in the STI Database. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those you will transmit to NASA, DOD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to:

ATTN: Acquisitions Specialist
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320.

Reprints of journal articles, book chapters, and conference papers are also welcome.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on a public sale at the NASA Center for AeroSpace Information. Copyrighted publications will be announced but not distributed or sold.

Federal Regional Depository Libraries

ALABAMA

AUBURN UNIV. AT MONTGOMERY LIBRARY

Documents Dept.
7300 University Dr.
Montgomery, AL 36117-3596
(205) 244-3650 Fax: (205) 244-0678

UNIV. OF ALABAMA

Amelia Gayle Gorgas Library
Govt. Documents
P.O. Box 870266
Tuscaloosa, AL 35487-0266
(205) 348-6046 Fax: (205) 348-0760

ARIZONA

DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS

Research Division
Third Floor, State Capitol
1700 West Washington
Phoenix, AZ 85007
(602) 542-3701 Fax: (602) 542-4400

ARKANSAS

ARKANSAS STATE LIBRARY

State Library Service Section
Documents Service Section
One Capitol Mall
Little Rock, AR 72201-1014
(501) 682-2053 Fax: (501) 682-1529

CALIFORNIA

CALIFORNIA STATE LIBRARY

Govt. Publications Section
P.O. Box 942837 - 914 Capitol Mall
Sacramento, CA 94337-0091
(916) 654-0069 Fax: (916) 654-0241

COLORADO

UNIV. OF COLORADO - BOULDER

Libraries - Govt. Publications
Campus Box 184
Boulder, CO 80309-0184
(303) 492-8834 Fax: (303) 492-1881

DENVER PUBLIC LIBRARY

Govt. Publications Dept. BSG
1357 Broadway
Denver, CO 80203-2165
(303) 640-8846 Fax: (303) 640-8817

CONNECTICUT

CONNECTICUT STATE LIBRARY

231 Capitol Avenue
Hartford, CT 06106
(203) 566-4971 Fax: (203) 566-3322

FLORIDA

UNIV. OF FLORIDA LIBRARIES

Documents Dept.
240 Library West
Gainesville, FL 32611-2048
(904) 392-0366 Fax: (904) 392-7251

GEORGIA

UNIV. OF GEORGIA LIBRARIES

Govt. Documents Dept.
Jackson Street
Athens, GA 30602-1645
(706) 542-8949 Fax: (706) 542-4144

HAWAII

UNIV. OF HAWAII

Hamilton Library
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948-8230 Fax: (808) 956-5968

IDAHO

UNIV. OF IDAHO LIBRARY

Documents Section
Rayburn Street
Moscow, ID 83844-2353
(208) 885-6344 Fax: (208) 885-6817

ILLINOIS

ILLINOIS STATE LIBRARY

Federal Documents Dept.
300 South Second Street
Springfield, IL 62701-1796
(217) 782-7596 Fax: (217) 782-6437

INDIANA

INDIANA STATE LIBRARY

Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204-2296
(317) 232-3679 Fax: (317) 232-3728

IOWA

UNIV. OF IOWA LIBRARIES

Govt. Publications
Washington & Madison Streets
Iowa City, IA 52242-1166
(319) 335-5926 Fax: (319) 335-5900

KANSAS

UNIV. OF KANSAS

Govt. Documents & Maps Library
6001 Malott Hall
Lawrence, KS 66045-2800
(913) 864-4660 Fax: (913) 864-3855

KENTUCKY

UNIV. OF KENTUCKY

King Library South
Govt. Publications/Maps Dept.
Patterson Drive
Lexington, KY 40506-0039
(606) 257-3139 Fax: (606) 257-3139

LOUISIANA

LOUISIANA STATE UNIV.

Middleton Library
Govt. Documents Dept.
Baton Rouge, LA 70803-3312
(504) 388-2570 Fax: (504) 388-6992

LOUISIANA TECHNICAL UNIV.

Prescott Memorial Library
Govt. Documents Dept.
Ruston, LA 71272-0046
(318) 257-4962 Fax: (318) 257-2447

MAINE

UNIV. OF MAINE

Raymond H. Fogler Library
Govt. Documents Dept.
Orono, ME 04469-5729
(207) 581-1673 Fax: (207) 581-1653

MARYLAND

UNIV. OF MARYLAND - COLLEGE PARK

McKeldin Library
Govt. Documents/Maps Unit
College Park, MD 20742
(301) 405-9165 Fax: (301) 314-9416

MASSACHUSETTS

BOSTON PUBLIC LIBRARY

Govt. Documents
666 Boylston Street
Boston, MA 02117-0286
(617) 536-5400, ext. 226
Fax: (617) 536-7758

MICHIGAN

DETROIT PUBLIC LIBRARY

5201 Woodward Avenue
Detroit, MI 48202-4093
(313) 833-1025 Fax: (313) 833-0156

LIBRARY OF MICHIGAN

Govt. Documents Unit
P.O. Box 30007
717 West Allegan Street
Lansing, MI 48909
(517) 373-1300 Fax: (517) 373-3381

MINNESOTA

UNIV. OF MINNESOTA

Govt. Publications
409 Wilson Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 624-5073 Fax: (612) 626-9353

MISSISSIPPI

UNIV. OF MISSISSIPPI

J.D. Williams Library
106 Old Gym Bldg.
University, MS 38677
(601) 232-5857 Fax: (601) 232-7465

MISSOURI

UNIV. OF MISSOURI - COLUMBIA

106B Ellis Library
Govt. Documents Sect.
Columbia, MO 65201-5149
(314) 882-6733 Fax: (314) 882-8044

MONTANA

UNIV. OF MONTANA

Mansfield Library
Documents Division
Missoula, MT 59812-1195
(406) 243-6700 Fax: (406) 243-2060

NEBRASKA

UNIV. OF NEBRASKA - LINCOLN

D.L. Love Memorial Library
Lincoln, NE 68588-0410
(402) 472-2562 Fax: (402) 472-5131

NEVADA

THE UNIV. OF NEVADA LIBRARIES

Business and Govt. Information Center
Reno, NV 89557-0044
(702) 784-6579 Fax: (702) 784-1751

NEW JERSEY

NEWARK PUBLIC LIBRARY

Science Div. - Public Access
P.O. Box 630
Five Washington Street
Newark, NJ 07101-7812
(201) 733-7782 Fax: (201) 733-5648

NEW MEXICO

UNIV. OF NEW MEXICO

General Library
Govt. Information Dept.
Albuquerque, NM 87131-1466
(505) 277-5441 Fax: (505) 277-6019

NEW MEXICO STATE LIBRARY

325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-3824 Fax: (505) 827-3888

NEW YORK

NEW YORK STATE LIBRARY

Cultural Education Center
Documents/Gift & Exchange Section
Empire State Plaza
Albany, NY 12230-0001
(518) 474-5355 Fax: (518) 474-5786

NORTH CAROLINA

UNIV. OF NORTH CAROLINA - CHAPEL HILL

Walter Royal Davis Library
CB 3912, Reference Dept.
Chapel Hill, NC 27514-8890
(919) 962-1151 Fax: (919) 962-4451

NORTH DAKOTA

NORTH DAKOTA STATE UNIV. LIB.

Documents
P.O. Box 5599
Fargo, ND 58105-5599
(701) 237-8886 Fax: (701) 237-7138

UNIV. OF NORTH DAKOTA

Chester Fritz Library
University Station
P.O. Box 9000 - Centennial and University Avenue
Grand Forks, ND 58202-9000
(701) 777-4632 Fax: (701) 777-3319

OHIO

STATE LIBRARY OF OHIO

Documents Dept.
65 South Front Street
Columbus, OH 43215-4163
(614) 644-7051 Fax: (614) 752-9178

OKLAHOMA

OKLAHOMA DEPT. OF LIBRARIES

U.S. Govt. Information Division
200 Northeast 18th Street
Oklahoma City, OK 73105-3298
(405) 521-2502, ext. 253
Fax: (405) 525-7804

OKLAHOMA STATE UNIV.

Edmon Low Library
Stillwater, OK 74078-0375
(405) 744-6546 Fax: (405) 744-5183

OREGON

PORTLAND STATE UNIV.

Branford P. Millar Library
934 Southwest Harrison
Portland, OR 97207-1151
(503) 725-4123 Fax: (503) 725-4524

PENNSYLVANIA

STATE LIBRARY OF PENN.

Govt. Publications Section
116 Walnut & Commonwealth Ave.
Harrisburg, PA 17105-1601
(717) 787-3752 Fax: (717) 783-2070

SOUTH CAROLINA

CLEMSON UNIV.

Robert Muldrow Cooper Library
Public Documents Unit
P.O. Box 343001
Clemson, SC 29634-3001
(803) 656-5174 Fax: (803) 656-3025

UNIV. OF SOUTH CAROLINA

Thomas Cooper Library
Green and Sumter Streets
Columbia, SC 29208
(803) 777-4841 Fax: (803) 777-9503

TENNESSEE

UNIV. OF MEMPHIS LIBRARIES

Govt. Publications Dept.
Memphis, TN 38152-0001
(901) 678-2206 Fax: (901) 678-2511

TEXAS

TEXAS STATE LIBRARY

United States Documents
P.O. Box 12927 - 1201 Brazos
Austin, TX 78701-0001
(512) 463-5455 Fax: (512) 463-5436

TEXAS TECH. UNIV. LIBRARIES

Documents Dept.
Lubbock, TX 79409-0002
(806) 742-2282 Fax: (806) 742-1920

UTAH

UTAH STATE UNIV.

Merrill Library Documents Dept.
Logan, UT 84322-3000
(801) 797-2678 Fax: (801) 797-2677

VIRGINIA

UNIV. OF VIRGINIA

Alderman Library
Govt. Documents
University Ave. & McCormick Rd.
Charlottesville, VA 22903-2498
(804) 824-3133 Fax: (804) 924-4337

WASHINGTON

WASHINGTON STATE LIBRARY

Govt. Publications
P.O. Box 42478
16th and Water Streets
Olympia, WA 98504-2478
(206) 753-4027 Fax: (206) 586-7575

WEST VIRGINIA

WEST VIRGINIA UNIV. LIBRARY

Govt. Documents Section
P.O. Box 6069 - 1549 University Ave.
Morgantown, WV 26506-6069
(304) 293-3051 Fax: (304) 293-6638

WISCONSIN

ST. HIST. SOC. OF WISCONSIN LIBRARY

Govt. Publication Section
816 State Street
Madison, WI 53706
(608) 264-6525 Fax: (608) 264-6520

MILWAUKEE PUBLIC LIBRARY

Documents Division
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 286-3073 Fax: (414) 286-8074

Typical Report Citation and Abstract

- ❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 39, OCTOBER 5, 2001

01 AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20010083022 National Aerospace Lab., Amsterdam, Netherlands

National Aerospace Laboratory Annual Report, 1999

Dec. 1999; 150p; In English

Report No.(s): PB2001-106364; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

Table of Contents: Introduction; General Survey; Research Activities; Internal and External Relations; Scientific Committee; International Co-operation; Capita Selecta; Appendices.

NTIS

Surveys; Research and Development; Aerospace Industry

02 AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also 34 Fluid Mechanics and Heat Transfer.

20010083347 National Aerospace Lab., Tokyo Japan

Aerodynamic Heating Measurements on Hypersonic Flight Experiment (HYFLEX) Vehicle

Fujii, K.; Watanabe, S.; Shirouzu, M.; Inoue, Y.; Kurotaki, T.; Dec. 2000; 76p; In Japanese; Portions of this document are not fully legible
Report No.(s): PB2001-106903; NAL-TR-1415; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Aerodynamic heating on the Hypersonic Flight Experiment vehicle was measured using newly developed sensors, calibrated by lamp heating tests. These sensors were shown to be of use for flight measurement purposes. The results of the aerodynamic heating measurements on the vehicle were compared with predictions based on cold hypersonic wind tunnel tests and CFD calculations. The flight results on the nose cap were lower than the predictions based on the wind tunnel tests in the stagnation region of around $t = 100$ sec. Comparison with real gas CFD results assuming a fully catalytic wall and non-catalytic wall indicate that this discrepancy is due to the effect of dissociation of the air, and can be explained by the dependence of catalyticity on surface temperature. For the measurements on the elevon, an increase in aerodynamic heating caused by boundary layer transition was observed immediately prior to it being observed on the windward fuselage.

NTIS

Computational Fluid Dynamics; Aerodynamic Heating; Temperature Measurement; Wind Tunnel Tests

20010085363 Federal Aviation Administration, Research and Development, Atlantic City, NJ USA

Video Landing Parameter Survey: Honolulu International Airport Final Report

Barnes, Terence, Federal Aviation Administration, USA; DeFiore, Thomas, Federal Aviation Administration, USA; Micklos, Richard, Federal Aviation Administration, USA; May 2001; 42p; In English

Contract(s)/Grant(s): DTFA03-94-Z-0029

Report No.(s): AD-A392531; DOT/FAA/AR-00/72; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Federal Aviation Administration (FAA) William J. Hughes Technical Center is conducting a series of video landing parameter surveys at high-activity commercial airports to acquire a better understanding of typical landing contact conditions for a wide variety of aircraft and airports as they relate to current aircraft design criteria and practices. This is the third of a series of landing parameter surveys. This report documents the results from a survey at Honolulu International Airport (HNL) performed in April 1996. Previous surveys were conducted first at John F. Kennedy International Airport (JFK) in June 1994 and later at Washington National Airport (DCA) performed in June 1995. At HNL, four video cameras were temporarily installed along the south side of runway 8L. Video images of 332 heavy, wide-body transports were captured, analyzed, and the results presented herein. Landing parameters presented include sink rate; approach speed; touchdown pitch, roll, and yaw angles and rates; off-center distance; and the touchdown distance from the runway threshold. Wind and weather conditions were also recorded and landing weights were available for most landings. Since this program is only concerned with overall statistical usage information, all data were processed and are presented without regard to the airline or flight number. This survey has reinforced the findings from the JFK survey concerning the landing impact parameters of heavy, wide-body aircraft. The results from this survey and the prior landing parameter surveys at JFK and DCA differ substantially from aircraft sink speeds reported 35 years ago during National Aeronautics and Space Administration (NASA) surveys. No other efforts to collect operational landing data were performed by either the FAA or NASA in the interim.

DTIC

Aircraft Landing; Aircraft Design; Design Analysis; Airports

20010085944 North Carolina State Univ., Dept. of Mechanical and Aerospace Engineering, Raleigh, NC USA

Unsteady Aerodynamic Measurements Using Multi-Element Hot-Film Arrays on an Oscillating Airfoil with Gurney Flaps

Price, Jennifer L., North Carolina State Univ., USA; Chokani, Ndaona, North Carolina State Univ., USA; Mangalam, Siva M., Tao Systems, Inc., USA; 2001; 12p; In English; 19th Applied Aerodynamics Conference, 11-14 Jun. 2001, Anaheim, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-2466; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experiments were conducted on an oscillating airfoil equipped with a Gurney flap. The airfoil was oscillated between 0.0deg-7.2deg and 0.0deg-14.4deg, at Reynolds numbers of 96×10^3 (exp 3), 169×10^3 (exp 3) and 192×10^3 (exp 3). These two ranges of angle of attack provide for attached and light stall flow conditions. The unsteady laminar boundary layer separation, transition-to-turbulence, and turbulent reattachment on the forward portion of the airfoil were measured using an array of surface-mounted hot-films sensors. The measurements show that the effect of the Gurney flap is to advance to a lower angle of attack these unsteady boundary layer events. Thus during pitch-down of the airfoil a larger separation bubble occurs.

Author

Unsteady Aerodynamics; Flapping; Oscillations; Airfoils; Laminar Boundary Layer; Reynolds Number

20010086237 NASA Langley Research Center, Hampton, VA USA

Dynamic Deformation Measurements of an Aeroelastic Semispan Model

Graves, Sharon S., NASA Langley Research Center, USA; Burner, Alpheus W., NASA Langley Research Center, USA; Edwards, John W., NASA Langley Research Center, USA; Schuster, David M., NASA Langley Research Center, USA; [2001]; 12p; In English; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-2454; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The techniques used to acquire, reduce, and analyze dynamic deformation measurements of an aeroelastic semispan wind tunnel model are presented. Single-camera, single-view video photogrammetry (also referred to as videogrammetric model deformation, or VMD) was used to determine dynamic aeroelastic deformation of the semispan 'Models for Aeroelastic Validation Research Involving Computation' (MAVRIC) model in the Transonic Dynamics Tunnel at the NASA Langley Research Center. Dynamic deformation was determined from optical retroreflective tape targets at five semispan locations located on the wing from the root to the tip. Digitized video images from a charge coupled device (CCD) camera were recorded and processed to automatically determine target image plane locations that were then corrected for sensor, lens, and frame grabber spatial errors. Videogrammetric dynamic data were acquired at a 60-Hz rate for time records of up to 6 seconds during portions

of this flutter/Limit Cycle Oscillation (LCO) test at Mach numbers from 0.3 to 0.96. Spectral analysis of the deformation data is used to identify dominant frequencies in the wing motion. The dynamic data will be used to separate aerodynamic and structural effects and to provide time history deflection data for Computational Aeroelasticity code evaluation and validation.

Author

Aeroelasticity; Deformation; Scale Models; Transonic Wind Tunnels; Semispan Models

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety; and 85 Technology Utilization and Surface Transportation.

20010083386 General Accounting Office, Accounting and Information Management Div., Washington, DC USA

Air Traffic Control. Good Progress on Interim Replacement for Outage-Plagued System, but Risks can be further Reduced

Oct. 1996; 44p; In English

Report No.(s): PB2001-107569; GAO/AIMD-97-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Because Display Channel Complex Rehost (DCCR) is a critical, yet short-lived, system and because of Federal Aviation Administration's (FAA's) poor track record in acquiring air traffic control (ATC) systems, we reviewed the DCCR acquisition. Our objectives were to determine (1) the portion of the recent major outages experienced at the five DCC-equipped en route centers that were attributable to DCC, (2) whether DCC was meeting its system availability requirement, (3) FAA's projections of future DCC outages and availability, and (4) whether FAA was effectively managing the DCCR acquisition to ensure delivery of specified capabilities on schedule and within estimated cost.

NTIS

Air Traffic Control; Safety; Routes; Schedules; Cost Estimates; Flight Safety

20010084643 NASA Ames Research Center, Moffett Field, CA USA

Parallel Processing Systems for Passive Ranging During Helicopter Flight

Sridhar, Bavavar, NASA Ames Research Center, USA; Suorsa, Raymond E., NASA Ames Research Center, USA; [1994]; 1p; In English; 3rd IEEE Conference on Control Applications, 22-24 Aug. 1994, Glasgow, UK; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): RTOP 505-64-36; No Copyright; Avail: Issuing Activity; Abstract Only

The complexity of rotorcraft missions involving operations close to the ground result in high pilot workload. In order to allow a pilot time to perform mission-oriented tasks, sensor-aiding and automation of some of the guidance and control functions are highly desirable. Images from an electro-optical sensor provide a covert way of detecting objects in the flight path of a low-flying helicopter. Passive ranging consists of processing a sequence of images using techniques based on optical low computation and recursive estimation. The passive ranging algorithm has to extract obstacle information from imagery at rates varying from five to thirty or more frames per second depending on the helicopter speed. We have implemented and tested the passive ranging algorithm off-line using helicopter-collected images. However, the real-time data and computation requirements of the algorithm are beyond the capability of any off-the-shelf microprocessor or digital signal processor. This paper describes the computational requirements of the algorithm and uses parallel processing technology to meet these requirements. Various issues in the selection of a parallel processing architecture are discussed and four different computer architectures are evaluated regarding their suitability to process the algorithm in real-time. Based on this evaluation, we conclude that real-time passive ranging is a realistic goal and can be achieved with a short time.

Author

Parallel Processing (Computers); Rangefinding; Flight Paths; Helicopters; Microprocessors; Architecture (Computers); Electro-Optics

20010085359 Federal Aviation Administration, Air Traffic Services, Washington, DC USA

Air Traffic Services Performance Plan FY2001-2003

Dec. 2000; 70p; In English

Report No.(s): PB2001-107568; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The Federal Aviation Administration's (FAA) Office of Air Traffic Services (ATS) is the largest of the FAA's six lines of business, with nearly 80 percent of its employees. The ATS mission is to ensure the safe and efficient operation, maintenance, and use of the current air transportation system, and to meet tomorrow's challenges to increase system safety, capacity, and productivity. The purpose of the ATS Performance Plan (Plan) is to link ATS performance goals to the FAA mission goals of safety, security, and system efficiency, by establishing performance targets, presenting performance trends, and describing strategies and initiatives. The Plan also provides an overview of the ATS organization and the challenges in maintaining and modernizing the National Airspace System (NAS). The Plan meets the requirements of the Government Performance and Results Act of 1993.

NTIS

Air Transportation; Systems Engineering; Security; Warning Systems; Safety Factors; Air Traffic Control; Systems Analysis

20010085360 Federal Aviation Administration, Washington, DC USA

Notices to Airmen Domestic/International, June 14, 2001

Jun. 14, 2001; 326p; In English

Report No.(s): PB2001-106574; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

NOTAM information current as of May 22, 2001 Flight Data Center (FDC) NOTAMs listed through 1/4882, dated May 22, 2001 NOTE: FDC NOTAMs for temporary flight restrictions are not published in this document.

NTIS

Aircraft Pilots; Constrictions; Flight Operations

20010085964 Civil Aerospace Medical Inst., Oklahoma City, OK USA

Aviation Accidents and Incidents Associated With the Use of Ophthalmic Devices by Civilian Pilots Final Report

Nakagawara, Van B., Civil Aerospace Medical Inst., USA; Montgomery, Ron W., Civil Aerospace Medical Inst., USA; Wood, Kathryn J., Civil Aerospace Medical Inst., USA; July 2001; 16p; In English

Report No.(s): DOT/FAA/AM-01/14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Approximately 54% of civilian pilots rely on ophthalmic lenses to correct defective vision and maintain a valid airman medical certificate. The use of these devices can potentially create operational problems in an aviation environment. This report reviews aviation accidents and incidents in which ophthalmic lenses used by civilian pilots were contributing factors in the mishaps between 1 January 1980 and 31 December 1998. Methods. The National Transportation Safety Board's (NTSB's) Aviation Accident/Incident Database and the Federal Aviation Administration's (FAA's) Incident Data System were queried for terms related to ophthalmic lenses for the period 1980-98. All reports annotated with ophthalmic terms were reviewed and stratified based on the type of ophthalmic correction used and if the device was determined to be a factor in the mishap. Additionally, the Aviation Safety Reporting System (ASRS), which allows aviation personnel to report actual or potential discrepancies and deficiencies involving the safety of aviation operations, was similarly queried and reviewed for the period 1988-98. Results. The NTSB and FAA databases included 16 mishaps in which factors, such as lost/broken eyeglasses, problems with sunglasses, incompatibility with personal protective breathing equipment, adaptation difficulties, inappropriate ophthalmic prescriptions and contact lenses, were found to be contributing factors in aviation accidents or incidents. Aviation personnel voluntarily submitted 26 ASRS reports describing operational problems involving traditional ophthalmic devices that adversely affected aviation safety. Conclusions. Ophthalmic devices used by pilots have contributed to aviation accidents and incidents. The review and reporting of these mishaps and self-reported operational problems provide important information that may be used to educate flight crewmembers, Aviation Medical Examiners, and eyecare practitioners about the potential hazards of using inappropriate ophthalmic devices. Recommendations that can assist pilots in avoiding similar hazardous situations and enhance aviation safety are discussed.

Author

Ophthalmology; Aircraft Accidents; Aircraft Safety; Operational Problems

20010086422 Civil Aeromedical Inst., Civil Aeromedical Inst., Oklahoma City, OK USA

Association of Postmortem Blood Hemoglobin A(sub 1c) Levels With Diabetic Conditions in Aviation Accident Pilot Fatalities Final Report

White, V. L.; Chaturvedi, A. K.; Canfield, D. V.; Garber, M.; Jul. 2001; 7p; In English

Report No.(s): AD-A392942; DOT/FAA/AM-01/12; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The Federal Aviation Administration's (FAA's) Office of Aerospace Medicine evaluates present and proposed medical certification standards for pilots. Under this responsibility, the FAA Civil Aerospace Medical Institute investigates the role of potential medical-or drug-related performance impairment in pilots. In previous research, abnormal glucose levels in vitreous humor (>125 mg/dL) and urine (>100 mg/dL) have been linked with diabetic conditions in pilots of fatal aviation accidents.

Although these abnormal glucose levels identify pilots with elevated blood sugar at the time of death, they do not provide information on how well diabetes was controlled in these pilots. Since post-crash factors (trauma, stress, medical intervention) can dramatically affect blood glucose levels, a measure of long-term diabetic control was sought for postmortem specimens. Methods. Blood specimens from volunteers were collected and stored at room temperature for up to 52 days to mimic a postmortem condition. These specimens were analyzed for hemoglobin A1c (HbA(sub 1c)) at selected time intervals during the 52-day period. Postmortem blood specimens from 34 aviation accident pilot fatalities were also analyzed. Some of these pilots had a known history of diabetes. Results. HbA1c values in blood from volunteers did not significantly change for up to 52 days. The HbA(sub 1c) concentration in postmortem blood samples from pilots ranged from 3.9-10.5%. Only one pilot with a HbA(sub 1c) over 6.0% did not have a history of diabetes reported to the FAA. Conclusions. HbA(sub 1c) is stable in whole blood stored at room temperature for 52 days and appears to be stable in postmortem blood stored up to 84 days. HbA(sub 1c) above 6.0% was found to be generally correlated with a known history of diabetes and with the abnormal vitreous humor and urine glucose levels established previously.

DTIC

Aerospace Medicine; Blood; Hemoglobin; Metabolic Diseases; Aircraft Accidents; Accident Investigation

20010089337 NASA Langley Research Center, Hampton, VA USA

Enhanced Airport Capacity Through Safe, Dynamic Reductions in Aircraft Separation: NASA's Aircraft VORtex Spacing System (AVOSS)

OConnor, Cornelius J., NASA Langley Research Center, USA; Rutishauser, David K., NASA Langley Research Center, USA; August 2001; 15p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 727-01-26-02

Report No.(s): NASA/TM-2001-211052; NAS 1.15:211052; L-18112; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An aspect of airport terminal operations that holds potential for efficiency improvements is the separation criteria applied to aircraft for wake vortex avoidance. These criteria evolved to represent safe spacing under weather conditions conducive to the longest wake hazards, and are consequently overly conservative during a significant portion of operations. Under many ambient conditions, such as moderate crosswinds or turbulence, wake hazard durations are substantially reduced. to realize this reduction NASA has developed a proof-of-concept Aircraft Vortex Spacing System (AVOSS). Successfully operated in a real-time field demonstration during July 2000 at the Dallas Ft. Worth International Airport, AVOSS is a novel integration of weather sensors, wake sensors, and analytical wake prediction algorithms. Gains in airport throughput using AVOSS spacing as compared to the current criteria averaged 6%, with peak values approaching the theoretical maximum of 16%. The average throughput gain translates to 15-40% reductions in delay when applied to realistic capacity ratios at major airports.

Author

Vortex Avoidance; Wakes; Air Traffic Control; Flight Hazards; Aircraft Approach Spacing

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications; Spacecraft Communications, Command and Tracking, and 32 Communications and Radar.

20010083871 NASA Langley Research Center, Hampton, VA USA

An Airborne Conflict Resolution Approach Using a Genetic Algorithm

Mondoloni, Stephane, CSSI, Inc., USA; Conway, Sheila, NASA Langley Research Center, USA; [2001]; 22p; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 6-9 Aug. 2001, Montreal, Canada; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-4054; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

An airborne conflict resolution approach is presented that is capable of providing flight plans forecast to be conflict-free with both area and traffic hazards. This approach is capable of meeting constraints on the flight plan such as required times of arrival (RTA) at a fix. The conflict resolution algorithm is based upon a genetic algorithm, and can thus seek conflict-free flight plans meeting broader flight planning objectives such as minimum time, fuel or total cost. The method has been applied to conflicts occurring 6 to 25 minutes in the future in climb, cruise and descent phases of flight. The conflict resolution approach separates the detection, trajectory generation and flight rules function from the resolution algorithm. The method is capable of supporting

pilot-constructed resolutions, cooperative and non-cooperative maneuvers, and also providing conflict resolution on trajectories forecast by an onboard FMC.

Author (AIAA)

Flight Plans; Flight Rules; Forecasting; Genetic Algorithms; Traffic

20010084990 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Integration, Testing and Flight of the EO-1 GPS

Quinn, David A., NASA Goddard Space Flight Center, USA; Sanneman, Paul A., Swales Aerospace, USA; Shulman, Seth E., Computer Sciences Corp., USA; Sager, Jennifer A., Honeywell, Inc., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 423-441; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The Global Positioning System has long been hailed as the wave of the future for autonomous on-board navigation of low Earth orbiting spacecraft despite the fact that relatively few spacecraft have actually employed it for this purpose. While several missions operated out of the Goddard Space Flight Center have flown GPS receivers on board, the New Millennium Program (NMP) Earth Orbiting-1 (EO-1) spacecraft is the first to employ GPS for active, autonomous on-board navigation. Since EO-1 was designed to employ GPS as its primary source of the navigation ephemeris, special care had to be taken during the integration phase of spacecraft construction to assure proper performance. This paper is a discussion of that process: a brief overview of how the GPS works, how it fits into the design of the EO-1 Attitude Control System (ACS), the steps taken to integrate the system into the EO-1 spacecraft, the ultimate on-orbit performance during launch and early operations of the EO-1 mission and the performance of the on-board GPS ephemeris versus the ground based ephemeris. Conclusions will include a discussion of the lessons learned.

Author

Satellite Attitude Control; Global Positioning System; Autonomous Navigation

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20010084306 Boeing Commercial Airplane Co., Seattle, WA USA

Investigation of Three Forms of the Modified Condition Decision Coverage (MCDC) Criterion *Final Report*

Chilenski, J. J., Boeing Commercial Airplane Co., USA; Apr. 2001; 224p; In English

Report No.(s): PB2001-106553; DOT/FAA/AR-01/18; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

This report compares three forms of Modified Condition Decision Coverage (MCDC). MCDC is a structural coverage criterion used to assist with the assessment of the adequacy of the requirements-based testing process. This level of coverage is required for Level A software. The purpose of these comparisons is to provide data to enable a rational choice for what form of structural coverage is required for Level A software. This report provides justification why structural coverage, in general, and MCDC in particular, should be part of the software system development process. Definitions for three forms of MCDC are given, along with extensions for relational operators. These three forms of MCDC are compared theoretically and empirically for minimum probability of error detection performance and ease of satisfaction. Conclusion from the data are drawn and limitations of the study methodology are identified.

NTIS

Software Engineering; Aircraft Reliability; Computer Programming; Program Verification (Computers)

20010084641 Tennessee Univ., Knoxville, TN USA

Performance Evaluation of an OH-58A+ With Dimpletape(R) Installed

Deetman, Gregg A.; Aug. 2001; 136p; In English; Original contains color plates; Financial sponsord in part by U.S. Army Technical Application Program Office (TAPO)

Report No.(s): AD-A390459; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

This flight test investigates the performance benefits of a recently developed vortex generator, called Dimpletape(registered), on an OH-58A+ helicopter rotor blade. This product employs the aerodynamic concepts that are used to reduce the drag on a golf ball. The manufacturer claims significant performance benefits with the product applied to airplane wings and propellers;

however, no flight-testing has been conducted on commercial helicopter rotor blades. Four different Dimpletape(registered) lengths were flight-tested on an OH-58A+ to determine the optimum Dimpletape(registered) length and cordwise placement on the main rotor blades for the greatest performance gain. The flight-testing consisted of a quantitative performance evaluation including hover performance (free hover method), level flight performance (W/sigma, weight over density ratio test method), and autorotative performance flight tests. The flight test results show that there is an insignificant reduction in power when Dimpletape(registered) is applied to the outboard 10% (19.5 inches) of the rotor blade at the maximum camber point (optimum Dimpletape(registered) length and position tested). In most of the tests Dimpletape(registered) increased the power requirements of the rotor system.

DTIC

Performance Tests; Flight Tests; Vortex Generators

20010084776 NASA Dryden Flight Research Center, Edwards, CA USA

Full Envelope Reconfigurable Control Design for the X-33 Vehicle

Cotting, M. Christopher, NASA Dryden Flight Research Center, USA; Burken, John J., NASA Dryden Flight Research Center, USA; [2001]; 6p; In English; AIAA Guidance, Navigation and Control Conference, 6-10 Aug. 2001, Montreal, Quebec, Canada; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-1234; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the event of a control surface failure, the purpose of a reconfigurable control system is to redistribute the control effort among the remaining working surfaces such that satisfactory stability and performance are retained. An Off-line Nonlinear General Constrained Optimization (ONCO) approach was used for the reconfigurable X-33 control design method. Three example failures are shown using a high fidelity 6 DOF simulation (case 1 ascent with a left body flap jammed at 25 deg.; case 2 entry with a right inboard elevon jam at 25 deg.; and case 3, landing (TAEM) with a left rudder jam at -30 deg.) Failure comparisons between responses with the nominal controller and reconfigurable controllers show the benefits of reconfiguration. Single jam aerosurface failures were considered, and failure detection and identification is considered accomplished in the actuator controller. The X-33 flight control system will incorporate reconfigurable flight control in the baseline system.

Author

X-33 Reusable Launch Vehicle; Flight Control; Control Systems Design; Failure; Design Analysis; Aerodynamic Configurations; Aircraft Design; Controllers

20010084784 Galaxy Scientific Corp., Egg Harbor Township, NJ USA

Evaluation of the Probabilistic Design Methodology and Computer Code for Composite Structures *Final Report*

Shiao, M.; Jun. 2001; 42p; In English

Contract(s)/Grant(s): DTFA03-95-D-00035

Report No.(s): PB2001-107611; DOT/FAA/AR-99/12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the results of an independent evaluation on the numerical accuracy and computational efficiency of a probabilistic design methodology for composite aircraft structures. The methodology was developed by Northrop-Grumman Commercial Aircraft Division (NGCAD) under the Federal Aviation Administration (FAA) funding through Interagency Agreement DTFA03-94-A-40021, while the associated PC-based computer code MONTE was developed through FAA Grant 96-G-0036 with the University of Texas at Arlington. The probability calculation of NGCAD's probabilistic methodology is based on the conditional expectation method (CEM) to determine the failure probability of a specified failure event. This methodology was first verified by traditional Monte Carlo simulation (MCS) method using the computer code NESSUS developed by the National Aeronautical and Space Administration (NASA). Since Monte Carlo simulation is not efficient for small probability calculation, a mixed probabilistic method (MPM) was developed in this study to verify the results from MONTE in the 10 (sup -6) or less probability level. The mixed probabilistic method requires a decomposition of the overall failure function into several conditional failure functions. The probability of failure for conditional failure functions is first calculated using the CEM. The overall failure probability is then computed using the probability integration method (PIM). The mixed probabilistic method is implemented in the computer code NESSUS.

NTIS

Computer Programs; Aircraft Maintenance; Composite Structures; Composite Materials; Probability Theory

20010085958 Defence Science and Technology Organisation, Airframes and Engines Div., Fishermans Bend, Australia

Review of F-111 Structural Materials

Mills, T., Aerostructures Technologies Pty Ltd., Australia; Clark, G., Defence Science and Technology Organisation, Australia; Loader, C., Defence Science and Technology Organisation, Australia; Sharp, P. K., Defence Science and Technology

Organisation, Australia; Schmidt, R., Defence Science and Technology Organisation, Australia; March 2001; 128p; In English
Report No.(s): DSTO-TR-1118; DODA-AR-011800; Copyright; Avail: Issuing Activity

The RAAF is now the sole operator of the F-111 and current plans for the fleet will keep the aircraft in service until 2020. The F-111 is a structurally complex aircraft, and its swing-wing geometry in particular requires materials of ultra high strength to handle expected loadings. In particular, the D6ac steel used in most of the critical components in the aircraft was subjected to rigorous research efforts in the early 1970s to better characterise material performance in fatigue. This report summarises many of these efforts to characterise the main alloys in the airframe, namely: D6ac steel and aluminium alloys 2024-T851, 7079-T651, and 7075-T6. The major goal is to study the available data for these critical F-111 materials, evaluate the completeness of the existing data sets and make recommendations for research efforts necessary to ensure that the F-111 fleet is operated as safely and economically as possible until retired. Particular attention is paid to the fact that the RAAF now uses JP-8 fuel rather than the original JP-4 fuel. Short crack behaviour from corrosion damage will likely be a concern for the F-111, particularly in the D6ac steel. Stress corrosion cracking is likely to continue to be the biggest problem for the 7xxx-series aluminium alloy components and will have to be monitored carefully.

Author

Airframe Materials; Aluminum Alloys; Crack Propagation; F-111 Aircraft; Stress Corrosion Cracking; Cumulative Damage; High Strength Steels

20010086968 Maryland Univ., Dept. of Mechanical Engineering, College Park, MD USA

Virtual Structural Dynamics, Acoustics and Control Final Report, 31 Mar. 2000 - 30 Mar. 2001

Baz, Amr R.; Jun. 2001; 7p; In English; Original contains color plates

Contract(s)/Grant(s): DAAD19-00-1-0088

Report No.(s): AD-A392659; ARO-40725.1-EG-RIP; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Equipment is needed to establish a Virtual Reality (VR) facility at the University of Maryland in College Park. The facility will enable engineers to Design, Simulate, Visualize and Test (DSVT) the dynamics, acoustics and controls of complex SMART structural systems in a virtual environment. With such facility, engineers will be immersed in an audio-visually coupled tele-operated environment whereby direct interaction with and control of the DSVT process can be achieved in real time. In this manner, the behavior of synthetic structural models can be monitored by literally walking through the structure and adjusting its design parameters as needed to ensure optimal performance while satisfying design and operational requirements. For example, engineers can move electronic wands to vary the number, size, type and location of sensors and actuators in a helicopter cabin, monitor the resulting closed-loop structural vibrations visually or by haptic feedback and simultaneously listen to the radiated sound pressure field. Such manipulations of the virtual smart objects in the scene are carried out while the engineer is navigating through the helicopter cabin to ensure that the vibration and sound levels, at any critical locations, are within the acceptable limits. The facility will serve also as a platform for virtual training of students and engineers on designing and operating complex smart structural controls on site as well as through collaborative efforts with other VR sites.

DTIC

Computer Aided Design; Virtual Reality; Computerized Simulation; Dynamic Structural Analysis; Real Time Operation; Acoustics; Smart Structures; Control Equipment; Complex Systems

20010088241 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA

Interlaboratory Study (ILS) on the Standard Test Method for Measuring Grid Line Slope (GLS) in Aerospace Transparencies Final Report, Jul. - Dec. 1999

Pinkus, Alan R.; Task, Harry L.; May 2001; 63p; In English

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A392444; AFRL-HE-WP-TR-2001-0104; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

When an observer looks through an aerospace transparency, relative optical distortion may result, specifically in thick, highly angled, multi-layered plastic parts. Distortion occurs in all transparencies but is especially critical to aerospace applications such as combat and commercial aircraft windscreens, canopies and cabin windows. This is especially true during certain operations such as takeoff, landing and aerial refueling. It is critical to be able to quantify optical distortion for procurement activities. The test method covers apparatus and procedures that are suitable for measuring the grid line slope (GLS) of transparent parts including those that are small or large, thin or thick, flat or curved, or already installed. This ILS determined the test method's measurement precision.

DTIC

Slopes; Computational Grids; Aerospace Engineering

20010089372 Army Safety Center, Fort Rucker, AL USA

Army Aviation Risk-Management Information: Being too Polite Can Get You Killed

FLIGHTFAX; Jul. 2001; Volume 29, No. 7, pp. July 2001; In English

Report No.(s): AD-A392574; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flightfax is published by the U.S. Army Safety Center, Fort Rucker, AL. Information is for accident-prevention purposes only and is specifically prohibited for use for punitive purposes or matters of liability, litigation, or competition. This issue contains topics including crew coordination, ACT(Army Aircrew Coordination Training), communication issues, UH-60 Main Rotor Blade Pin notice, aviation tool sets, accident briefs, and the ALSE(Aviation Life Support Equipment) Users' Conference.

DTIC

Aircraft Accidents; Accident Prevention; Education; Aircraft Safety

07

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

20010083962 NASA Langley Research Center, Hampton, VA USA

Scramjet Tests in a Shock Tunnel at Flight Mach 7, 10, and 15 Conditions

Rogers, R. C., NASA Langley Research Center, USA; Shih, A. T., NASA Langley Research Center, USA; Tsai, C.-Y., General Applied Science Labs., Inc., USA; Foelsche, R. O., General Applied Science Labs., Inc., USA; [2001]; 12p; In English; 37th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 9-11 Jul. 2001, Salt Lake City, UT, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-3241; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Tests of the Hyper-X scramjet engine flowpath have been conducted in the HYPULSE shock tunnel at conditions duplicating the stagnation enthalpy at flight Mach 7, 10, and 15. For the tests at Mach 7 and 10 HYPULSE was operated as a reflected-shock tunnel; at the Mach 15 condition, HYPULSE was operated as a shock-expansion tunnel. The test conditions matched the stagnation enthalpy of a scramjet engine on an aerospace vehicle accelerating through the atmosphere along a 1000 psf dynamic pressure trajectory. Test parameter variation included fuel equivalence ratios from lean (0.8) to rich (1.5+); fuel composition from pure hydrogen to mixtures of 2% and 5% silane in hydrogen by volume; and inflow pressure and Mach number made by changing the scramjet model mounting angle in the HYPULSE test chamber. Data sources were wall pressures and heat flux distributions and schlieren and fuel plume imaging in the combustor/nozzle sections. Data are presented for calibration of the facility nozzles and the scramjet engine model. Comparisons of pressure distributions and flowpath streamtube performance estimates are made for the three Mach numbers tested.

Author (AIAA)

Aerospace Vehicles; Combustion Chambers; Hydrogen; Hypersonic Speed; Plumes; Shock Tunnels; Supersonic Combustion Ramjet Engines; Test Chambers

20010085364 SRI International Corp., Menlo Park, CA USA

Improved Barriers to Turbine Engine Fragments: Interim Report III Annual Report

Shockey, D. A., SRI International Corp., USA; Erlich, David C., SRI International Corp., USA; Simons, Jeffrey W., SRI International Corp., USA; May 2001; 105p; In English; Original contains color plates

Contract(s)/Grant(s): SRI-95-G-010-VOL-3

Report No.(s): AD-A392533; DOT/FAA/AR-99/8; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

In support of the Federal Aviation Administration's Catastrophic Failure Prevention Program, SRI International has identified advanced materials and is developing shielding concepts to protect critical aircraft components from uncontained engine debris. Full-scale fragment impact tests on a commercial aircraft fuselage confirmed that barriers made from high-strength polymer fabrics in the fuselage wall could prevent penetration into the cabin. A computational capability is now being developed to enable efficient design of fabric fragment barriers. A mathematical model of woven fabric made from Zylon polybenzazoles (PBO), Kevlar, or Spectra was constructed using the data and observations from laboratory tests to measure yarn tensile and friction properties, quasi-static penetration tests to measure the evolution and phenomenology of fabric deformation and failure, and projectile impact tests to measure effects of fabric material, mesh density, boundary conditions (how a fabric is gripped), and projectile sharpness. The model was implemented in the LS-DYNA3D finite element code and used to simulate the failure

behavior of yarns and fabrics under impact scenarios. The resulting insights are assisting barrier design. A simplified version of the computational model is being developed to enhance its usefulness to the commercial aircraft industry in designing engine fragment barriers.

DTIC

Aircraft Engines; Fragments; Damage; Impact Tests; Turbine Engines; Polymers; Computerized Simulation; Full Scale Tests; Aircraft Construction Materials

08

AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also 05 Aircraft Design, Testing and Performance and 06 Avionics and Aircraft Instrumentation.

20010089368 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Simultaneous Attitude Control and Energy Storage Using VSCMGs: Theory and Simulation

Richie, David J.; Apr. 2001; 162p; In English; Original contains color plates

Report No.(s): AD-A392541; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This work examines the simultaneous use of single-gimbal Variable Speed Control Moment Gyroscopes (VSCMGs) as spacecraft attitude control actuators and energy storage devices. The resulting theory is then used as the foundation for designing the VSCMG Workbench, a simulation tool designed to meet the Air Force Research Laboratory's need for a realistic/flexible compute simulation for conceptual analysis and hardware-in-the-loop testing. This tool allows both Georgia Tech and AFRL's Space Vehicles Directorate a low-cost alternative for analyzing the feasibility of employing a combined attitude control/energy storage system as well as the technical details to create such a system for different types of spacecraft. Its modularity permits adding more model fidelity in the future with little user training required.

DTIC

Attitude Control; Energy Storage; Control Moment Gyroscopes; Actuators; Spacecraft Control; Speed Control

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see 03 Air Transportation and Safety. For astronautical facilities see 14 Ground Support Systems and Facilities (Space).

20010083468 National Aerospace Lab., Tokyo Japan

Model with Turbine Powered Simulators at NAL's Low Speed Wind Tunnel Facility

Dec. 2000; 74p; In Japanese; Portions of this document are not fully legible

Report No.(s): PB2001-106904; NAL-TR-1421; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This paper describes a test system of an 8% scale model of STOL aircraft 'ASKA' with turbine powered simulators tested at the Low Speed Wind Tunnel (6.5m) of National Aerospace Laboratory (NAL). The purpose of the system is to achieve high accurate measurements of aerodynamic forces by eliminating piping interferences. The paper also describes performance of the piping interference elimination function and overall system test results.

NTIS

Simulators; Turbines; Aerodynamic Forces

20010084723 NASA Ames Research Center, Moffett Field, CA USA

Flow Quality Measurements in the NASA Ames Upgraded 11-by 11-Foot Transonic Wind Tunnel

Amaya, Max A., NASA Ames Research Center, USA; Murthy, Sreedhara V., Sverdrup Technology, Inc., USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Among the many upgrades designed and implemented in the NASA Ames 11-by 11-Foot Transonic Wind Tunnel over the past few years, several directly affect flow quality in the test section: a turbulence reduction system with a honeycomb and two screens, a flow smoothing system in the back leg diffusers, an improved drive motor control system, and a full replacement set of composite blades for the compressor. Prior to the shut-down of the tunnel for construction activities, an 8-foot span rake populated with flow instrumentation was traversed in the test section to fully document the flow quality and establish a baseline

against which the upgrades could be characterized. A similar set of measurements was performed during the recent integrated system test trials, but the scope was somewhat limited in accordance with the primary objective of such tests, namely to return the tunnel to a fully operational status. These measurements clearly revealed substantial improvements in flow angularity and significant reductions in turbulence level for both full-span and semi-span testing configurations, thus making the flow quality of the tunnel one of the best among existing transonic facilities.

Author

Transonic Wind Tunnels; Honeycomb Structures; Compressors

20010085956 Institute for Human Factors TNO, Soesterberg, Netherlands

Desdemona, from Concept to Operational Facility Interim Report Desdemona, van Plan tot Realiteit

Hosman, R. J. A. W., Institute for Human Factors TNO, Netherlands; Bles, W., Institute for Human Factors TNO, Netherlands; May 10, 2001; 44p; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): 013.38310; TNO Proj. 789.3

Report No.(s): TD2001-0140; TM-01-A034; Copyright; Avail: Issuing Activity

On the basis of an inventory of the necessary technical preparations we have made a proposal to the realisation of a fast and efficient installation and initialisation of Desdemona as disorientation demonstrator and flight simulator.

Author

Disorientation; Flight Simulators; Human Centrifuges; Vestibular Tests

20010086426 Civil Aerospace Medical Inst., Oklahoma City, OK USA

Qualification Guidelines for Personal Computer-Based Aviation Training Devices: Private Pilot Certificate Final Report

Williams, Kevin W., Civil Aerospace Medical Inst., USA; July 2001; 80p; In English

Contract(s)/Grant(s): AM-A-97-HRR-510

Report No.(s): DOT/FAA/AM-01/13; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

As part of the development of qualification guidelines for a personal computer-based aviation training device (PCATD), a task analysis of flight tasks for the private pilot certificate has been completed and is reported in this paper. The primary goal of the task analysis was to identify training device requirements for supporting specific private pilot maneuvers. Before PCATDs can be authorized for use as qualified and approved training devices within a private pilot flight training course, a set of qualification guidelines must be developed for use by the FAA in evaluating such potential training devices. This task analysis constitutes the first steps in the development of those qualification guidelines.

Author

Computer Techniques; Pilot Training; Education; Training Devices

20010087785 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA

The Radar Correlation and Interpolation (C&I) Algorithms Deployed in the ASR-9 Processor Augmentation Card (9PAC)

Elkin, G. R.; Jun. 29, 2001; 184p; In English

Report No.(s): AD-A392704; PR-ATC-299; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

The Airport Surveillance Radar 9 (ASR-9) is a terminal radar that was deployed by the FAA during the early 1990's at more than 130 of the busiest airports in the USA. The ASR-9 Processor Augmentation Card (9PAC), developed at MIT Lincoln Laboratory, is a processor board enhancement for the ASR-9 post-processor. The increased processing speed and memory size of the 9PAC hardware made it possible for new surveillance algorithms to be developed in software in order to provide improved primary radar and beacon surveillance performance. This report describes improvements to the primary radar correlation and interpolation (C&I) process, which is responsible for creating aircraft target reports and filtering out false targets. The 9PAC C&I provides the following improvements: (1) it automates the creation and modification of the road and ground clutter geocensoring process, which had been a time-consuming human-in-the-loop process; (2) it improves the rejection of false targets using multi-layered false target filtering maps; and (3) it improves the detection of general aviation and military aircraft that are not equipped with beacon transponders or have them turned off. The algorithms described in this report have been implemented as part of 9PAC Phase II, which is currently being tested by the FAA at Dallas-Fort Worth, Salt Lake City, Honolulu, Las Vegas, Oakland, Palm Springs, and Sarasota airports. The 9PAC primary radar algorithms function in coordination with beacon processing algorithms which are resident in either the 9PAC for the interim beacon interrogator (IBI) mode of operation or the

Mode S sensor for monopulse operation. In the former, the 9PAC performs the functions of radar beacon reinforcement whereas in the latter, the Mode S sensor provides the function.

DTIC

Radar Equipment; Statistical Correlation; Interpolation; Algorithms; Augmentation

20010088091 NASA Langley Research Center, Hampton, VA USA

Qualitative Assessment of the Acoustic Disturbance Environment in the NASA LaRC 20-Inch MACH 6 Wind Tunnel

Horvath, Thomas J., NASA Langley Research Center, USA; Berry, Scott A., NASA Langley Research Center, USA; Hamilton, H. Harris, NASA Langley Research Center, USA; [2001]; 12p; In English; 95th Supersonic Tunnel Association, International, 29 Apr - 2 May 2001, Hampton, VA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental investigation was conducted on a 5-degree-half-angle cone with a flare in a conventional Mach 6 wind tunnel to examine the effect of facility noise on boundary layer transition. The effect of tunnel noise was inferred by comparing transition onset locations determined from the present test to that previously obtained in a Mach 6 quiet tunnel. Together, the two sets of experiments are believed to represent the first direct comparison of transition onset between a conventional and a quiet hypersonic wind tunnel using a common test model. In the present conventional hypersonic tunnel experiment, adiabatic wall temperatures were measured and heat transfer distributions were inferred on the cone flare model at zero degree angle of attack over a range of length Reynolds numbers (2×10^6 to 10×10^6) which resulted in laminar and turbulent flow. Wall-to-total temperature ratio for the transient heating measurements and the adiabatic wall temperature measurements were 0.69 and 0.86, respectively. The cone flare nosetip radius was varied from 0.0001 to 0.125-inch to examine the effects of bluntness on transition onset. At comparable freestream conditions the transition onset Reynolds number obtained on the cone flare model in the conventional "noisy" tunnel was approximately 25% lower than that measured in the low disturbance tunnel.

Author

Wind Tunnel Tests; Noise Measurement; Boundary Layer Transition; Hypersonic Wind Tunnels; Half Cones; Free Flow; Flared Bodies; Wall Temperature; Hypersonic Heat Transfer; Aerodynamic Noise; Flow Visualization; Temperature Measurement

20010089085 Aerospace Medicine Squadron (366th), Mountain Home AFB, ID USA

Recirculating Ventilation System in an Integrated Maintenance Hangar Supporting B-1B and KC-135 Aircraft

Wander, Joseph D.; Adams, Brian S.; Gibbs, Stephen T.; Williston, Christopher A.; Jun. 26, 2001; 17p; In English
Report No.(s): AD-A392901; AFRL-ML-TY-TP-2001-0031; Paper-710; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

During 1998 the Corps of Engineers (CoE) built an integrated maintenance hangar (Building 198) to support maintenance of B-1B and KC-135 aircraft at Mountain Home Air Force Base (MHAFB). Recirculation of 80% of the exhaust air was included in the design as an energy conservation measure, and carbon adsorption was applied to the exhaust stream to capture VOCs. Routine Industrial Hygiene exposure sampling for chromate and for isocyanates was conducted by MHAFB staff during application of prime and top coats, respectively, and all measurements were below the respective method detection limits. However, although the CoE design delivered provided strong air movement in most areas inside the hangar, the ventilation field included many regions of intense turbulence, in which the application of paint is difficult. Some amelioration of turbulence was accomplished by adjustment of baffles and vents at the exits from the ventilation ducts, and the hangar is now in routine use, setting a concrete precedent for operating in Recirculating ventilation mode under the de minimis "violation" defined by OSHA and applied to 29 CFR 1910.107 (d) (9). MHAFB is planning an eventual hangar modification project to relocate the ventilation intakes and exhaust, to even out the airflow pattern.

DTIC

Ventilation; Aircraft Maintenance; C-135 Aircraft; B-1 Aircraft; Industrial Safety; Exhaust Gases; Circulation

20010089345 Institute for Human Factors TNO, Soesterberg, Netherlands

Simulators in Driving Education: A Field Study Into Transfer of Training Final Report

Sluimer, R. R., Institute for Human Factors TNO, Netherlands; vandenBosch, K., Institute for Human Factors TNO, Netherlands; Apr. 20, 2001; 20p; In English; Original contains color illustrations

Contract(s)/Grant(s): 013.18301; TNO Proj. 790.3

Report No.(s): TD2001-0134; TM-01-A030; Copyright; Avail: Issuing Activity

State of the art technology enables the development of a low-cost driving simulator that should be suitable for training traffic participation skills, like the application of traffic rules and lane selection. It is yet unclear what the effects are of simulator training on driving in actual traffic. Under contract of the Royal Netherlands Army, a study is conducted in which a group of novice drivers (passenger cars) receive training on the simulator in two traffic participation tasks. The transfer of training is compared with a

control group. The TNO low cost driver training simulator was stationed at a military driving school. Half of the 32 participants received, in addition to normal driving lessons, training on the simulator. The other half received the usual driver training program. The simulator group received training in negotiating intersections and roundabouts. After training, all trainees drove a route in actual traffic. At pre-specified locations (mainly intersections and roundabouts), examiners assessed trainees' driving behaviour on various aspects, like looking behaviour, speed control and direction indicating. Trainees that received just normal driver training performed significantly better than trainees that also received simulator training. It is possible that low-cost driving simulators are not (yet) suitable for training the investigated tasks. It is, however, also possible that outcomes are distorted by technical, didactic, and organisational problems. In future studies, simulators should be equipped with more advanced technical functionality, so that trainees (learn to) drive more easily and instructors can teach more easily. Finally, validation studies need to be carried out under rigorous experimental control.

Author

Training Simulators; Computerized Simulation; Virtual Reality; Control Simulation

12

ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see categories 13 through 20. For extraterrestrial exploration, see 91 Lunar and Planetary Science and Exploration.

20010084914 NASA Goddard Space Flight Center, Greenbelt, MD USA

MU-SPIN Conference Explorers Program Perspective

Barrowman, Jim, NASA Goddard Space Flight Center, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 131-134; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The mission of the Explorer Program is to provide frequent flight opportunities for world-class scientific investigations from space within the following space science themes: (1) Astronomical Search for Origins and Planetary Systems; (2) Structure and Evolution of the Universe (3) The Sun-Earth Connection. America's space exploration started with Explorer 1: (1) Launched February 1, 1958; (2) Discovered the Van Allen Radiation Belts; (3) Over 75 Explorer missions have flown.

Derived from text

Planetary Systems; Space Missions; Explorer 1 Satellite; Space Exploration; Cosmology; Astronomy

20010084944 Office of Naval Research, Ocean, Atmosphere and Space S and T Program Office, Arlington, VA USA

The Office of Naval Research, Ocean, Atmosphere and Space S and T Department, the Naval Space S and T Program Office

Regeon, Paul, Office of Naval Research, USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 16p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the Naval Space Science and Technology Program Office. Details are given on the Naval payloads (Remote Atmospheric Ionospheric Detection System (RADIS), Ionospheric Mapping and Geocoronal Experiment (IMAGE), and METOC Imager), Geosynchronous Earth Orbit mission, and enabling technologies.

CASI

Payloads; Remote Sensing; Research and Development

20010084949 Secretary of the Air Force, Washington, DC USA

Space Test Program (STP)

Ward, Michael, Secretary of the Air Force, USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 16p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

The Space Test Program (STP) provides spaceflight and on-orbit operations for highest priority Department of Defense (DoD) space experiments, based on rankings of annual DoD Space Experiments Review Board. STP investment pays dividends

in demonstrating new space technologies for military and commercial applications. to date, STP has flown 426 experiments on 135 missions since 1967. Of these, 113 missions have been successful (84% success rate).

Derived from text

Space Missions; Spaceborne Experiments

20010084952 Coleman Aerospace Co., USA

Coleman Aerospace Vehicle Systems

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 6p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

This viewgraph presentation gives an overview of the Coleman Aerospace Vehicle Systems, including details on the Leolink family of vehicles, their payload capacity, and payload envelopes.

CASI

Aerospace Vehicles; Payloads

20010084992 NASA Johnson Space Center, Houston, TX USA

Entry Debris Field Estimation Methods and Application to Compton Gamma Ray Observatory Disposal

Mrozinski, Richard B., NASA Johnson Space Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 455-469; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

For public safety reasons, the Compton Gamma Ray Observatory (CGRO) was intentionally deorbited on June 4, 2000. This deorbit was NASA's first intentional controlled deorbit of a satellite, and more will come including the eventual deorbit of the International Space Station. to maximize public safety, satellite deorbit planning requires conservative estimates of the debris footprint size and location. These estimates are needed to properly design a deorbit sequence that places the debris footprint over unpopulated areas, including protection for deorbit contingencies. This paper details a method for estimating the length (range), width (crossrange), and location of entry and breakup debris footprints. This method utilizes a three degree-of-freedom Monte Carlo simulation incorporating uncertainties in all aspects of the problem, including vehicle and environment uncertainties. The method incorporates a range of debris characteristics based on historical data in addition to any vehicle-specific debris catalog information. This paper describes the method in detail, and presents results of its application as used in planning the deorbit of the CGRO.

Author

Spacecraft Breakup; Spacecraft Reentry; Estimating; Reentry Trajectories

20010085778 NASA Goddard Space Flight Center, Greenbelt, MD USA

The NPOESS Preparatory Project: Mission Concept and Status

Murphy, Robert E., NASA Goddard Space Flight Center, USA; Taylor, Raynor, NASA Goddard Space Flight Center, USA; DeVito, Daniel S., NASA Goddard Space Flight Center, USA; Smith, Janice K., NASA Goddard Space Flight Center, USA; Henegar, Joy, NASA Goddard Space Flight Center, USA; Dodge, James C., NASA, USA; Wilczynski, Peter, National Oceanic and Atmospheric Administration, USA; Kelly, Michael, National Oceanic and Atmospheric Administration, USA; Schneider, Stanley, National Oceanic and Atmospheric Administration, USA; Welsch, Carol, National Oceanic and Atmospheric Administration, USA; [2001]; 3p; In English; National Geoscience and Remote Sensing Symposium, 9-13 Jul. 2001, Sydney, Australia; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project is a joint NASA/IPO (Integrated Program Office) mission to extend selected systematic measurements initiated by the Terra and Aqua missions and to provide risk reduction for NPOESS. The key sensor properties and mission features are summarized.

Author

Mission Planning; Risk; Spacecraft Equipment; Artificial Satellites; Polar Orbits

20010085779 NASA Goddard Space Flight Center, Greenbelt, MD USA

JEM-EF Space Station Carrier System

Daelemans, Gerard J., NASA Goddard Space Flight Center, USA; Goldsmith, Theodore C., Swales Aerospace, USA; [2001]; 1p; In English; ISS Symposium, 15-17 Oct. 2001, Cocoa Beach, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA/GSFC Shuttle Small Payloads Projects Office (SSPPO) is developing a carrier system for accommodating scientific and applications payloads on the Japanese Experiment Module - Exposed Facility (JEM-EF). The carrier structure provides for flexible mounting of payload instrumentation in nadir, zenith, or limb-viewing positions. Avionics capability will be provided to accommodate up to four payloads with independent power and signal connections. The JEM-EF carrier builds on

over 15 years of experience in developing and operating the "Hitchhiker" carriers used on the Space Shuttle. This paper describes the carrier system, potential payload configurational and related GSFC activities.

Author

Avionics; Space Shuttle Payloads; Space Stations; Japanese Space Program

20010087327 NASA Ames Research Center, Moffett Field, CA USA

Planning and Scheduling for Fleets of Earth Observing Satellites

Frank, Jeremy, NASA Ames Research Center, USA; Jonsson, Ari, Research Inst. for Advanced Computer Science, USA; Morris, Robert, NASA Ames Research Center, USA; Smith, David E., NASA Ames Research Center, USA; [2001]; 9p; In English; International Symposium on Artificial Intelligence, Robotics, Automation and Space, Jun. 2000, Montreal, Canada; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We address the problem of scheduling observations for a collection of earth observing satellites. This scheduling task is a difficult optimization problem, potentially involving many satellites, hundreds of requests, constraints on when and how to service each request, and resources such as instruments, recording devices, transmitters, and ground stations. High-fidelity models are required to ensure the validity of schedules; at the same time, the size and complexity of the problem makes it unlikely that systematic optimization search methods will be able to solve them in a reasonable time. This paper presents a constraint-based approach to solving the Earth Observing Satellites (EOS) scheduling problem, and proposes a stochastic heuristic search method for solving it.

Author

Scheduling; Artificial Satellites; Heuristic Methods; Management Systems

13

ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

20010084953 Space and Missile Systems Organization, USA

Orbital/Sub-Orbital Program

Buckley, Steve, Space and Missile Systems Organization, USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 32p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this Launch Test Program is to use excess ICBM assets and proven launch vehicles to provide cost-effective, highly reliable launch services for orbital and ballistic launch missions, support a wide range of payloads and orbits, and to provide quick turn one-stop launch service support.

Derived from text

Launch Vehicles; Launching; Payloads

20010084958 NASA Goddard Space Flight Center, Greenbelt, MD USA

2001 Flight Mechanics Symposium

Lynch, John P., Editor, NASA Goddard Space Flight Center, USA; June 2001; 588p; In English, 19-21 Jun. 2001, Greenbelt, MD, USA; See also 20010084959 through 20010085000

Report No.(s): NASA/CP-2001-209986; Rept-2001-02668-0; NAS 1.55:209986; NONP-NASA-CD-2001126425; No Copyright; Avail: CASI; A25, Hardcopy; A06, Microfiche

This conference publication includes papers and abstracts presented at the Flight Mechanics Symposium held on June 19-21, 2001. Sponsored by the Guidance, Navigation and Control Center of Goddard Space Flight Center, this symposium featured technical papers on a wide range of issues related to attitude/orbit determination, prediction and control; attitude simulation; attitude sensor calibration; theoretical foundation of attitude computation; dynamics model improvements; autonomous navigation; constellation design and formation flying; estimation theory and computational techniques; Earth environment mission analysis and design; and, spacecraft re-entry mission design and operations.

Author

Attitude (Inclination); Guidance (Motion); Navigation; Orbit Calculation; Satellite Orientation; Flight Mechanics

20010084961 Purdue Univ., School of Aeronautics and Astronautics, West Lafayette, IN USA

Periodic Orbits in the Vicinity of L1 and L2 in the Coherent Restricted Four-Body Problem

Guzman, Jose J., Purdue Univ., USA; Howell, Kathleen C., Purdue Univ., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 25-39; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

Consider the design of nominal orbits in the vicinity of the Sun-Earth collinear libration points. First, note that the equilibrium points actually exist only in the circular restricted three-body problem (CR3BP). As a result, for libration point missions, most of the analysis must be accomplished from the perspective of a model with, at least, three bodies. Unfortunately, for some cases in the Sun-Earth system, the qualitative behavior that is apparent in the CR3BP might be sometimes completely lost due to lunar perturbations. On the other hand, lunar gravity may be a key element in creating new types of solutions. Therefore, a formulation of the four-body problem is warranted, and the coherent restricted four-body problem is incorporated. In this model, the primaries satisfy the equations of motion, as derived in terms of a relative formulation, to some specified tolerance. To maximize the four-body model as a useful component, special solutions - such as periodic and quasi-periodic trajectories - can be initially isolated and identified. In this paper, the focus is on the computation of periodic orbits in the vicinity of the Moon perturbed Sun-Earth L1 and L2 libration points.

Author

Four Body Problem; Libration; Lunar Gravitational Effects; Spacecraft Orbits

20010084962 NASA Goddard Space Flight Center, Greenbelt, MD USA

Unique Non-Keplerian Orbit Vantage Locations for Sun-Earth Connection and Earth Science Vision Roadmaps

Folta, David, NASA Goddard Space Flight Center, USA; Young, Corissa, Colorado Univ., USA; Ross, Adam, Harvard Univ., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 41-51; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this investigation is to determine the feasibility of attaining and maintaining unique non-Keplerian orbit vantage locations in the Earth/Moon environment in order to obtain continuous scientific measurements. The principal difficulty associated with obtaining continuous measurements is the temporal nature of astrodynamics, i.e., classical orbits. This investigation demonstrates advanced trajectory designs to meet demanding science requirements which cannot be met following traditional orbital mechanic logic. Examples of continuous observer missions addressed include Earth pole-sitters and unique vertical libration orbits that address Sun-Earth Connection and Earth Science Vision roadmaps.

Author

Spacecraft Trajectories; Spacecraft Orbits; Earth-Moon System; Astrodynamics

20010084963 Aerospace Corp., Chantilly, VA USA

Collision Probability Analyses for Earth-Orbiting Satellites

Chan, Ken, Aerospace Corp., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 53-67; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

This paper is first concerned with a detailed calculation of the collision probability between the primary spacecraft and a single secondary orbiting object. The analysis is then extended to the case in which the secondary objects comprise a class having a specific altitude and inclination, the latter parameter not necessarily the same as that of the primary spacecraft. All the secondary objects in this class have ascending nodes uniformly distributed around the equator, and have phase angles uniformly distributed within an orbital plane. For a pairwise encounter, the starting point need not be a three-dimensional Gaussian distribution but is rather a two-dimensional Gaussian distribution defined in the plane perpendicular to the relative velocity vector at the point of closest approach. The ellipses of constant probability density function (pdf) are replaced by circles of constant pdf having the same area. This makes the Gaussian distribution isotropic in the plane of interest. The rationale for this is that the relative position vector at closest approach is random in direction in that plane, when one considers any member of the secondary objects encountering the primary spacecraft. The consequence is that the two-dimensional Gaussian distribution is replaced by the one-dimensional Rician distribution which involves the modified Bessel function of the first kind of zero order.

Derived from text

Collisions; Normal Density Functions; Probability Theory; Spacecraft Orbits

20010084964 NASA Goddard Space Flight Center, Greenbelt, MD USA

High Earth Orbit Design for Lunar-Assisted Medium Class Explorer Missions

McGiffin, Daniel A., Computer Sciences Corp., USA; Mathews, Michael, Computer Sciences Corp., USA; Cooley, Steven, NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 69-82; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

This study investigates the application of high-Earth orbit (HEO) trajectories to missions requiring long on-target integration times, avoidance of the Earth's radiation belt, and minimal effects of Earth and Lunar shadow periods which could cause thermal/mechanical stresses on the science instruments. As used here, a HEO trajectory is a particular solution to the restricted three-body problem in the Earth-Moon system with the orbit period being either 1/2 of, or 1/4 of, the lunar sidereal period. A primary mission design goal is to find HEO trajectories where, for a five-year mission duration, the minimum perigee radius is greater than seven Earth radii ($R_{\text{sub E}}$). This minimum perigee radius is chosen so that, for the duration of the mission, the perigee is always above the relatively heavily populated geosynchronous radius of 6.6 $R_{\text{sub E}}$. A secondary goal is to maintain as high an ecliptic inclination as possible for the duration of the mission to keep the apsis points well out of the Ecliptic plane. Mission design analysis was completed for launch dates in the month of June 2003, using both direct transfer and phasing loop transfer techniques, to a lunar swingby for final insertion into a HEO. Also provided are analysis results of eclipse patterns for the trajectories studied, as well as the effects of launch vehicle errors and launch delays.

Author

Earth Orbits; Earth-Moon System; Spacecraft Trajectories; Three Body Problem

20010084965 Space Products and Applications, Inc., Fairfax, VA USA

Alternate Forms of Relative Attitude Kinematics and Dynamics Equations

Xing, Guang Q., Space Products and Applications, Inc., USA; Parvez, Shabbir A., Space Products and Applications, Inc., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 83-97; In English; See also 20010084958

Contract(s)/Grant(s): NAS5-99163; No Copyright; Avail: CASI; A03, Hardcopy

In this paper the alternate forms of the relative attitude kinematics and relative dynamics equations are presented. These developments are different from the earlier developments that have been presented in other publications. The current forms of equations have the advantage of being simpler than earlier ones. These equations are applied in developing the necessary kinematics and dynamics for relative navigation in formation flying and virtual platforms. These equations also have application in the implementation of nonlinear full state feedback and nonlinear output feedback control for large attitude angle acquisition and tracking. This paper presents simulations from such a full state feedback control application.

Author

Attitude (Inclination); Kinematics; Nonlinear Feedback; Spacecraft Control

20010084966 NASA Goddard Space Flight Center, Greenbelt, MD USA

Evaluation of Relative Navigation Algorithms for Formation-Flying Satellites

Kelbel, David, Computer Sciences Corp., USA; Lee, Taesul, Computer Sciences Corp., USA; Long, Anne, Computer Sciences Corp., USA; Carpenter, J. Russell, NASA Goddard Space Flight Center, USA; Gramling, Cheryl, NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 99-113; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

Goddard Space Flight Center is currently developing advanced spacecraft systems to provide autonomous navigation and control of formation flyers. This paper discusses autonomous relative navigation performance for formations in eccentric, medium, and high-altitude Earth orbits using Global Positioning System (GPS) Standard Positioning Service (SPS) and intersatellite range measurements. The performance of several candidate relative navigation approaches is evaluated. These analyses indicate that the relative navigation accuracy is primarily a function of the frequency of acquisition and tracking of the GPS signals. A relative navigation position accuracy of 0.5 meters root-mean-square (RMS) can be achieved for formations in medium-attitude eccentric orbits that can continuously track at least one GPS signal. A relative navigation position accuracy of better than 75 meters RMS can be achieved for formations in high-altitude eccentric orbits that have sparse tracking of the GPS signals. The addition of round-trip intersatellite range measurements can significantly improve relative navigation accuracy for formations with sparse tracking of the GPS signals.

Author

Algorithms; Autonomous Navigation; Global Positioning System; Satellite Guidance

20010084967 Texas A&M Univ., Dept. of Aerospace Engineering, College Station, TX USA

Relative Navigation for Formation Flying of Spacecraft

Alonso, Roberto, Texas A&M Univ., USA; Du, Ju-Young, Texas A&M Univ., USA; Hughes, Declan, Texas A&M Univ., USA; Junkins, John L., Texas A&M Univ., USA; Crassidis, John L., Buffalo Univ., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 115-129; In English; See also 20010084958

Contract(s)/Grant(s): NCC5-448; AFOSR-32525-57200; 000512-0004-1999; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents a robust and efficient approach for relative navigation and attitude estimation of spacecraft flying in formation. This approach uses measurements from a new optical sensor that provides a line of sight vector from the master spacecraft to the secondary satellite. The overall system provides a novel, reliable, and autonomous relative navigation and attitude determination system, employing relatively simple electronic circuits with modest digital signal processing requirements and is fully independent of any external systems. Experimental calibration results are presented, which are used to achieve accurate line of sight measurements. State estimation for formation flying is achieved through an optimal observer design. Also, because the rotational and translational motions are coupled through the observation vectors, three approaches are suggested to separate both signals just for stability analysis. Simulation and experimental results indicate that the combined sensor/estimator approach provides accurate relative position and attitude estimates.

Author

Satellite Attitude Control; Autonomous Navigation; Computerized Simulation

20010084968 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Preliminary Formation Flying Orbit Dynamics Analysis for Leonardo-BRDF

Hughes, Steven P., NASA Goddard Space Flight Center, USA; Mailhe, Laurie M., AI Solutions, Inc., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 131; In English; See also 20010084958; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Leonardo-BRDF is a NASA mission concept proposed to allow the investigation of radiative transfer and its effect on the Earth's climate and atmospheric phenomenon. Enabled by the recent developments in small-satellite and formation flying technology, the mission is envisioned to be composed of an array of spacecraft in carefully designed orbits. The different perspectives provided by a distributed array of spacecraft offer a unique advantage to study the Earth's albedo. This paper presents the orbit dynamics analysis performed in the context of the Leonardo-BRDF science requirements. First, the albedo integral is investigated and the effect of viewing geometry on science return is studied. The method used in this paper, based on Gauss quadrature, provides the optimal formation geometry to ensure that the value of the integral is accurately approximated. An orbit design approach is presented to achieve specific relative orbit geometries while simultaneously satisfying orbit dynamics constraints to reduce formation-keeping fuel expenditure. The relative geometry afforded by the design is discussed in terms of mission requirements. An optimal two-burn initialization scheme is presented with the required delta-V to distribute all spacecraft from a common parking orbit into their appropriate orbits in the formation. Finally, formation-keeping strategies are developed and the associated delta-V's are calculated to maintain the formation in the presence of perturbations.

Author

Radiative Transfer; Orbital Mechanics; Earth Atmosphere; Radiation Effects; Mission Planning

20010084969 Department of the Air Force, USA

Reducing Formation-Keeping Maneuver Costs for Formation Flying Satellites in Low-Earth Orbit

Hamilton, Nicholas, Department of the Air Force, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 133-145; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

Several techniques are used to synthesize the formation-keeping control law for a three-satellite formation in low-earth orbit. The objective is to minimize maneuver cost and position tracking error. Initial reductions are found for a one-satellite case by tuning the state-weighting matrix within the linear-quadratic-Gaussian framework. Further savings come from adjusting the maneuver interval. Scenarios examined include cases with and without process noise. These results are then applied to a three-satellite formation. For both the one-satellite and three-satellite cases, increasing the maneuver interval yields a decrease in maneuver cost and an increase in position tracking error. A maneuver interval of 8-10 minutes provides a good trade-off between maneuver cost and position tracking error. An analysis of the closed-loop poles with respect to varying maneuver intervals explains the effectiveness of the chosen maneuver interval.

Author

Satellite Constellations; Cost Reduction; Satellite Control

20010084970 Maryland Univ., College Park, MD USA

An Investigation of Atmospheric Penetration to Modify the Right Ascension of Orbital Planes

Schultz, Joseph R., Maryland Univ., USA; Pines, Darryll J., Maryland Univ., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 147-161; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

Formation flying satellites positioned in similar orbits that vary only by different longitudes of the ascending node, Omega, create a regular, distributive constellation to cover the Earth. If the satellites in the constellation need to be launched by the same launch vehicle, there are two standard ways to transfer them to their proper position. The first approach involves transferring the

satellites with a propulsive impulse maneuver that is quick but requires a large amount of fuel. The second approach uses the Earth's J2 gravitational effect to position the satellites into their respective orbits without using much fuel, however, it may take many months to do so leading to higher operational costs. One novel approach that may lead to overall lower costs than both standard methods is to use atmospheric penetration maneuvers. Such maneuvers would be used to 'dip' into the atmosphere and take advantage of aerodynamic lift that can be designed into the satellite to achieve the new desired Omega. Depending on the orbit and satellite characteristics, this maneuver requires less fuel than the impulsive case and can be conducted on the order of days as compared to months over the J2 method. This paper details the atmospheric penetration maneuver and the conditions in which this transfer method will provide cost savings over the two approaches that are commonly used today.

Author

Aeromaneuvering; Satellite Constellations; Atmospheric Entry

20010084987 NASA Goddard Space Flight Center, Greenbelt, MD USA

Precise Orbit Determination for GEOSAT Follow-On Using Satellite Laser Ranging Data and Intermission Altimeter Crossovers

Lemoine, Frank G., NASA Goddard Space Flight Center, USA; Rowlands, David D., NASA Goddard Space Flight Center, USA; Luthcke, Scott B., NASA Goddard Space Flight Center, USA; Zelensky, Nikita P., Raytheon Information Technology and Scientific Services, USA; Chinn, Douglas S., Raytheon Information Technology and Scientific Services, USA; Pavlis, Despina E., Raytheon Information Technology and Scientific Services, USA; Marr, Gregory, NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 377-391; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The US Navy's GEOSAT Follow-On Spacecraft was launched on February 10, 1998 with the primary objective of the mission to map the oceans using a radar altimeter. Following an extensive set of calibration campaigns in 1999 and 2000, the US Navy formally accepted delivery of the satellite on November 29, 2000. Satellite laser ranging (SLR) and Doppler (Tranet-style) beacons track the spacecraft. Although limited amounts of GPS data were obtained, the primary mode of tracking remains satellite laser ranging. The GFO altimeter measurements are highly precise, with orbit error the largest component in the error budget. We have tuned the non-conservative force model for GFO and the gravity model using SLR, Doppler and altimeter crossover data sampled over one year. Gravity covariance projections to 70x70 show the radial orbit error on GEOSAT was reduced from 2.6 cm in EGM96 to 1.3 cm with the addition of SLR, GFO/GFO and TOPEX/GFO crossover data. Evaluation of the gravity fields using SLR and crossover data support the covariance projections and also show a dramatic reduction in geographically-correlated error for the tuned fields. In this paper, we report on progress in orbit determination for GFO using GFO/GFO and TOPEX/GFO altimeter crossovers. We will discuss improvements in satellite force modeling and orbit determination strategy, which allows reduction in GFO radial orbit error from 10-15 cm to better than 5 cm.

Author

Altimeters; Crossovers; Orbit Determination; Satellite Laser Ranging

20010084989 NASA Goddard Space Flight Center, Greenbelt, MD USA

Preliminary Results of NASA's First Autonomous Formation Flying Experiment: Earth Observing-1 (EO-1)

Folta, David, NASA Goddard Space Flight Center, USA; Hawkins, Albin, AI Solutions, Inc., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 409-422; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

NASA's first autonomous formation flying mission is completing a primary goal of demonstrating an advanced technology called enhanced formation flying. To enable this technology, the Guidance, Navigation, and Control center at the Goddard Space Flight Center has implemented an autonomous universal three-axis formation flying algorithm in executive flight code onboard the New Millennium Program's (NMP) Earth Observing-1 (EO-1) spacecraft. This paper describes the mathematical background of the autonomous formation flying algorithm and the onboard design and presents the preliminary validation results of this unique system. Results from functionality assessment and autonomous maneuver control are presented as comparisons between the onboard EO-1 operational autonomous control system called AutoCon(tm), its ground-based predecessor, and a stand-alone algorithm.

Author

Algorithms; Autonomy; Spacecraft Control

20010084991 NASA Goddard Space Flight Center, Greenbelt, MD USA

Trajectory Design and Control for the Compton Gamma Ray Observatory Re-Entry

Hoge, Susan, NASA Goddard Space Flight Center, USA; Vaughn, Frank J., Jr., NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 443-454; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The Compton Gamma Ray Observatory (CGRO) controlled re-entry operation was successfully conducted in June of 2000. The surviving parts of the spacecraft landed in the Pacific Ocean within the nominal impact target zone. The design of the maneuvers to control the trajectory to accomplish this re-entry presented several challenges. These challenges included the timing and duration of the maneuvers, propellant management, post-maneuver state determination, collision avoidance with other spacecraft, accounting for the break-up of the spacecraft into several pieces with a wide range of ballistic coefficients, and ensuring that the impact footprint would remain within the desired impact target zone in the event of contingencies. This paper presents the initial re-entry trajectory design and traces the evolution of that design into the maneuver sequence used for the re-entry. The paper also discusses the spacecraft systems and operational constraints imposed on the trajectory design and the required modifications to the initial design based on those constraints. Data from the reentry operation are also presented.

Author

Reentry Trajectories; Trajectory Control; Spacecraft Trajectories

20010084993 Colorado Univ., Colorado Center for Astrodynamics Research, Boulder, CO USA

Orbit Determination for the QuikSCAT Spacecraft

Thompson, Blair F., Colorado Univ., USA; Meek, Matthew C., Colorado Univ., USA; Kubitschek, Daniel G., Colorado Univ., USA; Gold, Kenn L., Colorado Univ., USA; Axelrad, Penina, Colorado Univ., USA; Born, George H., Colorado Univ., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 471-484; In English; See also 20010084958

Contract(s)/Grant(s): 97BSM00005; No Copyright; Avail: CASI; A03, Hardcopy

The QuikSCAT satellite was launched on June 19, 1999. The primary mission payload is the SeaWinds scatterometer designed to measure wind speed and direction near the ocean's surface. The Colorado Center for Astrodynamics Research (CCAR) was contracted to provide an operational orbit determination (OD) system capable of providing 100 m orbit accuracy using the navigation solutions computed by the onboard GPS receivers, and to investigate two alternative OD strategies. Based on several sample solutions, the operational OD system is shown to produce root-mean-square (RMS) position errors between 28 and 31 m, seven-day overlapping arc position errors between 15 and 25 m, and one-day arc overlaps between 5 and 6 m. Periodically, ten minute bursts of pseudorange and carrier phase data are telemetered to the ground. We have investigated the performance of an OD system based on these observations. Orbits generated with the smoothed navigation solutions differ from single-differenced pseudorange solutions by less than 10 m. A third investigation considers the feasibility of a back-up system using antenna azimuth and elevation angles from three ground tracking stations. Results of processing these three data types are presented: (1) GPS navigation solutions; (2) GPS pseudorange burst data; and (3) ground-based azimuth and elevation data.

Author

Orbit Determination; Scatterometers; Root-Mean-Square Errors

20010084995 NASA Goddard Space Flight Center, Greenbelt, MD USA

Image Mission Attitude Support Experiences

Ottenstein, N., Computer Sciences Corp., USA; Challa, M., Computer Sciences Corp., USA; Home, A., Computer Sciences Corp., USA; Harman, R., NASA Goddard Space Flight Center, USA; Burley, R., NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 497-511; In English; See also 20010084958

Contract(s)/Grant(s): GS-35F-4381G; NASA Order S-43411-G; NASA Order S-36490-G; No Copyright; Avail: CASI; A03, Hardcopy

The spin-stabilized Imager for Magnetopause to Aurora Global Exploration (IMAGE) is the National Aeronautics and Space Administration's (NASA's) first Medium-class Explorer Mission (MIDEX). IMAGE was launched into a highly elliptical polar orbit on March 25, 2000 from Vandenberg Air Force Base, California, aboard a Boeing Delta II 7326 launch vehicle. This paper presents some of the observations of the flight dynamics analyses during the launch and in-orbit checkout period through May 18, 2000. Three new algorithms - one algebraic and two differential correction - for computing the parameters of the coning motion of a spacecraft are described and evaluated using in-flight data from the autonomous star tracker (AST) on IMAGE. Other attitude aspects highlighted include support for active damping consequent upon the failure of the passive nutation damper, performance evaluation of the AST, evaluation of the Sun sensor and magnetometer using AST data, and magnetometer calibration.

Author

Satellite Orientation; Image Satellite; Flight Characteristics; Algorithms

20010084996 Hammers Co., USA

On-Orbit Pointing Performance for the New Millennium Earth Observing-1 Spacecraft

Blackman, Kathie, Hammers Co., USA; Speer, Dave, Litton Advanced Systems, USA; Shulman, Seth, Computer Sciences Corp., USA; Hunt, Teresa, Swales Aerospace, USA; Sanneman, Paul, Swales Aerospace, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 513-526; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The NASA New Millennium Program (NMP) Earth Observing-1 (EO-1) spacecraft was launched in November 2000 on its primary mission to validate advanced remote sensing instruments. This paper provides a summary of the early orbit checkout of the spacecraft, paying special attention to the initial acquisition sequence, science pointing performance, Kalman filter attitude determination, and system calibration. EO-1 pointing performance is meeting the 2-sigma pointing requirement as well as the 3-sigma goal for science imaging. The operational issues and estimated accuracy are presented for the Lockheed Martin AST-201 Star Tracker, the Litton G&C Space Inertial Reference Unit and the Loral Space Systems GPS Tensor receiver. This paper will also provide an overall summary of all attitude control modes, including the raster scan slew required for instrument lunar calibration.

Author

Satellite Orientation; Satellite Attitude Control; Checkout; Raster Scanning

20010084997 Hubert Astronautics, Inc., USA

Surface Tension Lockup in the IMAGE Nutation Damper: Anomaly and Recovery

Hubert, Carl, Hubert Astronautics, Inc., USA; Swanson, Daniel, Lockheed Martin Space Systems Co., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 527; In English; See also 20010084958; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Early telemetry from the spin-stabilized IMAGE spacecraft indicated that the vehicle's initial nutation was not decaying. This behavior was especially puzzling because the spacecraft's passive nutation damper behaved as expected while IMAGE was attached to the spinning upper stage. The lack of damping was also puzzling because the damper was a tubular ring partially filled with liquid mercury; a simple, reliable device with a long flight history. In a partially-filled ring damper, the excess kinetic energy associated with nutation is dissipated by fluid viscosity when inertial forces cause the liquid to move through the tube. However, post-launch analysis indicated that the IMAGE damper liquid was immobilized by surface tension. This was an unanticipated consequence of the vehicle's low spin rate. When it became apparent that passive damping did not work, a ground-commanded open-loop damper was developed using the spacecraft's magnetic torquer and onboard logic that was intended for ground test of the torquer. This work-around successfully resolved the IMAGE nutation damping problem.

Author

Damping; Nutation; Torquers

20010084998 NASA Goddard Space Flight Center, Greenbelt, MD USA

Hubble Space Telescope Servicing Mission 3A Rendezvous Operations

Lee, S., Lockheed Martin Technical Operations, Inc., USA; Anandakrishnan, S., Lockheed Martin Technical Operations, Inc., USA; Connor, C., Lockheed Martin Technical Operations, Inc., USA; Moy, E., Lockheed Martin Technical Operations, Inc., USA; Smith, D., Lockheed Martin Technical Operations, Inc., USA; Myslinski, M., Honeywell Technology Solutions, Inc., USA; Markley, L., NASA Goddard Space Flight Center, USA; Vernacchio, A., NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 529-543; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The Hubble Space Telescope (HST) hardware complement includes six gas bearing, pulse rebalanced rate integrating gyros, any three of which are sufficient to conduct the science mission. After the loss of three gyros between April 1997 and April 1999 due to a known corrosion mechanism, NASA decided to split the third HST servicing mission into SM3A, accelerated to October 1999, and SM3B, scheduled for November 2001. SM3A was developed as a quick turnaround 'Launch on Need' mission to replace all six gyros. Loss of a fourth gyro in November 1999 caused HST to enter Zero Gyro Sunpoint (ZGSP) safemode, which uses sun sensors and magnetometers for attitude determination and momentum bias to maintain attitude stability during orbit night. Several instances of large attitude excursions during orbit night were observed, but ZGSP performance was adequate to provide power-positive sun pointing and to support low gain antenna communications. Body rates in ZGSP were estimated to exceed the nominal 0.1 deg/sec rendezvous limit, so rendezvous operations were restructured to utilize coarse, limited life, Retrieval Mode Gyros (RMGs) under Hardware Sunpoint (HWSP) safemode. Contingency procedures were developed to conduct the rendezvous in ZGSP in the event of RMGA or HWSP computer failure. Space Shuttle Mission STS-103 launched on December 19, 1999 after a series of weather and Shuttle-related delays. After successful rendezvous and grapple under

HWSP/RMGA, the crew changed out all six gyros. Following deploy and systems checkout, HST returned to full science operations.

Author

Gyroscopes; Hubble Space Telescope; Space Shuttle Missions; Spacecraft Maintenance

20010085000 Science Applications International Corp., USA

Horizon Scanner Triggering Height Analysis for OrbView-2

Patt, Frederick S., Science Applications International Corp., USA; Bilanow, Stephen, Science Applications International Corp., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 559-573; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The OrbView-2 spacecraft (OV-2) was launched in August 1997 from a Pegasus vehicle and maneuvered to a 705 km altitude, Sun-synchronous orbit with a local noon descending node. The spacecraft carries the Sea-viewing Wide Field-of-view Sensor (SeaWiFS). The science data processing is performed by the SeaWiFS Project Office at NASA/GSFC. The definitive attitude determination for image geolocation is performed as part of Level 1 product generation by post-processing the spacecraft attitude sensor data. The geolocation accuracy requirement is 1 pixel (2 sigma), which corresponds to 1.12 km at nadir. OV-2 is equipped with two horizon scanners for redundancy. In November 1998 one string of the attitude control system, including one of the scanners, was powered off to save electrical power and sensor lifetime. In order to meet the one-pixel requirement with the single scanner, an accurate model of the horizon scanner triggering height was needed. Analysis of the triggering height was performed using data from both scanners prior to November 1998. This analysis showed significant variations in triggering height from the basic oblate Earth model. The height had a different oblateness than the solid Earth, and also showed latitudinal variations which had a seasonal dependence. A model was developed to incorporate the observed variations in scanner triggering height. This model has been implemented in the SeaWiFS Project processing software, and has been instrumental in meeting the geolocation accuracy requirement for all data processed using the single scanner.

Author

Satellite Orientation; Horizon Scanners; Attitude Control

14

GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also 09 Research and Support Facilities (Air).

20010086480 Oral Roberts Univ., Dept. of Engineering and Physics, Tulsa, OK USA

Spinning Rocket Simulator Turntable Design Final Report

Miles, Robert W., Oral Roberts Univ., USA; Apr. 09, 2001; 43p; In English

Contract(s)/Grant(s): NAG5-7378; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contained herein is the research and data acquired from the Turntable Design portion of the Spinning Rocket Simulator (SRS) project. The SRS Project studies and eliminates the effect of coning on thrust-propelled spacecraft. This design and construction of the turntable adds a structural support for the SRS model and two degrees of freedom. The two degrees of freedom, radial and circumferential, will help develop a simulated thrust force perpendicular to the plane of the spacecraft model while undergoing an unstable coning motion. The Turntable consists of a ten-foot linear track mounted to a sprocket and press-fit to a thrust bearing. A two-inch high column grounded by a Triangular Baseplate supports this bearing and houses the slip rings and pressurized, air-line swivel. The thrust bearing allows the entire system to rotate under the moment applied through the chain-driven sprocket producing a circumferential degree of freedom. The radial degree of freedom is given to the model through the helically threaded linear track. This track allows the Model Support and Counter Balance to simultaneously reposition according to the coning motion of the Model. Two design factors that hinder the linear track are bending and twist due to torsion. A Standard Aluminum "C" channel significantly reduces these two deflections. Safety considerations dictate the design of all the components involved in this project.

Author

Coning Motion; Degrees of Freedom; Spacecraft Models; Spin Stabilization; Simulators; Supports; Motion Stability

LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also 18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.

20010083349 Institute of Space Medico-Engineering, Beijing, China

Space Medicine and Medical Engineering

Liu, Y.; Hangtian Yixue Yu Yixue Gongcheng; Feb. 2001; Volume 14, No. 1; 87p; In Mixed; Portions of this document are not fully legible

Report No.(s): PB2001-106251; Copyright; Avail: National Technical Information Service (NTIS)

Partial Contents: Changes in Vasoreactivity of Rat Pulmonary Artery af 7 d Tail-suspension; Changes of Cardiac Function during 21 d Head-down Tilt Bed Rest and the Effect of Lower Body Negative Pressure in the Last Week; Changes of Cardiovascular Indices during Head-up Tilt Plus Lower Body Negative Pressure; Study of Induced Mutation of Sorghum Seeds on Recoverable Satellites; Changes of Alpha Glucomembrane Protein and Prostaglandin at 5380 m above Sea Level; Changes of Arterial Blood Pressure during Various Stages in Spaceflight Activities.

NTIS

Aerospace Medicine; Cardiovascular System; Heart Function

20010083353 NASA Ames Research Center, Moffett Field, CA USA

Parallel Unsteady Turbopump Flow Simulations for Reusable Launch Vehicles

Kiris, Cetin, Eloret Corp., USA; Kwak, Dochan, NASA Ames Research Center, USA; [2000]; 13p; In English; Computing the Future III, 26-28 Jun. 2000, Half Moon Bay, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An efficient solution procedure for time-accurate solutions of Incompressible Navier-Stokes equation is obtained. Artificial compressibility method requires a fast convergence scheme. Pressure projection method is efficient when small time-step is required. The number of sub-iteration is reduced significantly when Poisson solver employed with the continuity equation. Both computing time and memory usage are reduced (at least 3 times). Other work includes Multi Level Parallelism (MLP) of INS3D, overset connectivity for the validation case, experimental measurements, and computational model for boost pump.

Author (revised)

Navier-Stokes Equation; Reusable Launch Vehicles; Turbine Pumps; Incompressible Flow; Unsteady Flow; Parallel Flow

20010084928 NASA Goddard Space Flight Center, Greenbelt, MD USA

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference

Cutlip, William, Editor, NASA Goddard Space Flight Center, USA; October 1999; 550p; In English; First Annual NRO-OSL/GSFC-ATS Rideshare Conference, 15-16 Apr. 1999, Dulles, VA, USA; See also 20010084929 through 20010084957; CD-ROM contains full text document in a variety of formats

Report No.(s): NASA/CP-1999-209482; Rept-99A01867; NAS 1.55:209482; NONP-NASA-CD-2001116065; No Copyright; Avail: CASI; A23, Hardcopy; A04, Microfiche; C01, CD-ROM

This document contains the proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference. The conference was held April 16-16, 1999, at the Litton/TASC Facility, Dulles, Virginia, and was co-chaired by William Cutlip, Goddard Space Flight Center Access to Space Group, and Jim Liller, National Reconnaissance Office, Office of Space Launch.

Author

Conferences; Spacecraft Launching; Space Transportation; Launch Vehicles

20010084929 NASA Goddard Space Flight Center, Greenbelt, MD USA

Phases

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 11p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

The Access to Space Agent is responsible for the successful provision of timely, comprehensive information regarding access opportunities, technical details specific to each opportunity, related cost information, and supplier specified points-of-contact.

Derived from text

Project Planning; Websites; User Requirements

20010084930 NASA Goddard Space Flight Center, Greenbelt, MD USA

The ATS Web Page Provides "Tool Boxes" for: Access Opportunities, Performance, Interfaces, Volume, Environments, "Wish List" Entry and Educational Outreach

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 9p; In English; See also 20010084928; No Copyright; Avail: CASI; A02, Hardcopy

This viewgraph presentation gives an overview of the Access to Space website, including information on the 'tool boxes' available on the website for access opportunities, performance, interfaces, volume, environments, 'wish list' entry, and educational outreach.

CASI

Education; Websites; Astronomy

20010084931 NASA Goddard Space Flight Center, Greenbelt, MD USA

Access to Space: Providing a Ride to Your Future

Cutlip, William E., NASA Goddard Space Flight Center, USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 40p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the Access to Space website, including information on the personnel structure, mission statement, process flow, project formulation, project support, web-based tools and database, web site contents, implementation plan, user registration, mission data input, capabilities of the website, and accomplishments thus far.

CASI

Websites; Astronomy; User Requirements

20010084932 NASA Goddard Space Flight Center, Greenbelt, MD USA

Quick Ride: Acquisition Overview

Adams, W. James, NASA Goddard Space Flight Center, USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 10p; In English; See also 20010084928; No Copyright; Avail: CASI; A02, Hardcopy

Quick Ride is an outgrowth of rapid spacecraft acquisition. It provides a variety of low-cost, short lead time satellite rides for science instruments. Task order contracts with commercial firms will permit placing an order within 30 days. Secondary objectives include a demonstration of a FAR Part 12 commercial acquisition and the exploration of the use of on-ramps.

Derived from text

Satellite Instruments; Project Planning

20010084933 NASA Goddard Space Flight Center, Greenbelt, MD USA

Spartan Project Overview

Carson, Donald E., NASA Goddard Space Flight Center, USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 10p; In English; See also 20010084928; No Copyright; Avail: CASI; A02, Hardcopy

The Spartan Project is the result of Office of Space Science requirements for a transition capability between sounding rockets and orbital missions. The project started early in the Shuttle program and drew from suborbital program designs, GAS programs, and existing Marshall Space Flight Center's bridge and attach mechanisms. Features include reusable Shuttle-based carriers. Spartan is an in-house project drawing support from a mix of support service contractors and matrixed discipline support from Goddard Space Flight Center organizations

Derived from text

Project Planning; Spaceborne Experiments; Launch Vehicles; Reusable Spacecraft

20010084935 Air Force Research Lab., USA

MightySat Program: Information Briefing for NRO Rideshare Conference

Thomas, Pete, Air Force Research Lab., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 13p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

The purposes of this viewgraph presentation on the MightySat program are to briefly describe the MightySat program, review MightySat II.2 payload capability, discuss MightySat II.2 manifest process, identify current II.2 manifest status, and discuss II.1 and II.2 launch vehicle interests.

Derived from text

Launch Vehicles; Artificial Satellites; Mission Planning

20010084936 Spectrum Astro, Inc., Gilbert, AZ USA

NRO Ride Share Conference

Yeakel, Scott; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 10p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

This viewgraph presentation gives an overview of the Spectrum Astro and the multiple strategies utilized to control and reduce cost. Products include sophisticated small to mid-size satellites, space hardware, ground support, and research and development products. There has been a high productivity, low overhead, 'get-the-job-done' culture over the last ten years, when there were 118 contracts and \$140 million in government investment. There has been consistent successful cost and schedule performance.

Derived from text

Cost Reduction; Spacecraft Electronic Equipment; Artificial Satellites

20010084938 Lockheed Martin Corp., USA

Athena: Capabilities and Concepts

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 8p; In English; See also 20010084928; No Copyright; Avail: CASI; A02, Hardcopy

This viewgraph presentation gives an overview of the RideShare approaches and benefits. The assumed types of RideShares include co-manifest (two spacecraft of relatively equal size), secondary (small payloads or spacecraft relative to primary), and multi-manifest (two or more spacecraft of like size and function), and there are different standardized technical and contractual solutions for each. RideShares provides users with increased launch flexibility and opportunities, more affordable per-payload launch costs, and can serve as a price discriminator in competitive bidding.

Derived from text

Payloads; Satellite Design; Standardization

20010084939 Orbital Sciences Corp., Advanced Systems Dept., USA

Orbital Spacecraft Buses

Howard, Regan E., Orbital Sciences Corp., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 10p; In English; See also 20010084928; No Copyright; Avail: CASI; A02, Hardcopy

This viewgraph presentation gives an overview of the orbital spacecraft buses. Details are given on the Orbview-1, MicroStar, ORBCOMM, Orbview-4, GALEX (Galaxy Evolution Explorer), SAVE/SOLSTICE, GEO Quick Ride, and Star-2.

CASI

Artificial Satellites; Specifications

20010084942 Science Applications International Corp., USA

Orbiting Technology Testbed Initiative (OTTI)

Ritter, Jim, Science Applications International Corp., USA; Campbell, Art, Naval Research Lab., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 14p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the Orbiting Technology Testbed Initiative (OTTI). Information is given on NASA and commercial space challenges, and how the OTTI program will overcome the challenges. OTTI is a program to: (1) explore novel emerging breakthrough technologies and advanced SOA devices and adaptive subsystems with substantial potential impact on space system performance; and (2) decrease the time and cost required for insertion into future NASA systems by space demonstrations and by leveraging commercial space systems.

CASI

Aerospace Systems; Technology Assessment; Performance Prediction; Artificial Satellites

20010084946 United Space Alliance, USA

USA Alliance: Products and Services for Space Operations

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 4p; In English; See also 20010084928; No Copyright; Avail: CASI; A01, Hardcopy

This viewgraph presentation gives an overview of the products and services for space operations, including details on space hardware processing, on-orbit operations, launch and return operations, and space systems training. The 'reimbursable missions' are described, i.e., the two flight opportunities on OV-102 Columbia and the leasing of the Space Shuttle's payload bay.

CASI

Aerospace Systems; Payloads

20010084954 NASA, Washington, DC USA

NASA Headquarters/Kennedy Space Center: Organization and Small Spacecraft Launch Services

Sierra, Albert; Beddel, Darren; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 41p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

The objectives of the Kennedy Space Center's (KSC) Expendable Launch Vehicles (ELV) Program are to provide safe, reliable, cost effective ELV launches, maximize customer satisfaction, and perform advanced payload processing capability development. Details are given on the ELV program organization, products and services, foreign launch vehicle policy, how to get a NASA launch service, and some of the recent NASA payloads.

Derived from text

Launch Vehicles; Policies; Spacecraft Launching

20010084955 Orbital Sciences Corp., Pegasus Program Office, Dulles, VA USA

Orbital Launch Systems

Morris, Edward, Jr., Orbital Sciences Corp., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 18p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the orbital launch systems, including information on Orbital's family of launch vehicles, Pegasus' and Taurus' flight heritage, information on Pegasus and Taurus launch vehicles, the L-1011 carrier aircraft, Pegasus capable launch sites to date, and the GeoSat follow-on.

CASI

L-1011 Aircraft; Launch Vehicles

20010084956 Boeing Co., Expendable Launch Systems, Huntington Beach, CA USA

Delta Launch Services

Files, Bill, Boeing Co., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 19p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the Delta launch services. Information is given for the expendable launch systems (Delta II, Delta III, Delta IV, Titan Fairing, Sea Launch), new and emerging launch vehicles, payload range, Delta II program summary, Delta III program, secondary payload accommodations, and payload planning.

CASI

Spacecraft Launching; Delta 3 Launch Vehicle; Delta 4 Launch Vehicle

20010084957 Lockheed Martin Corp., USA

Atlas V

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 12p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the Atlas V launch vehicle, including details on its evolution, common element concept, launch system, hardware development progress, critical design review summary, and an update on the RD-180.

CASI

Atlas Launch Vehicles; Design Analysis; Systems Engineering

20010086419 Surrey Satellite Technology Ltd., Guildford, UK

Catalytic Decomposition of Nitrous Oxide for Spacecraft Propulsion Applications, Phase 1 Final Report

Richardson, Guy; Oct. 11, 2000; 112p; In English

Contract(s)/Grant(s): F61775-99-WE100

Report No.(s): AD-A392935; SPC-99-4100; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

This report results from a contract tasking Surrey Satellite Technology, Ltd. as follows: Work package 1(2 months - \$10 K)
A paper study will be undertaken to compare nitrous oxide mono-propellant thrusters with hydrogen peroxide and hydrazine

mono-propellant thrusters. A test plan for the nitrous oxide mono-propellant thrusters experimental work will also be produced. Work package 2 (10 months - \$40 K) From the experimental data an operational envelope for each catalyst will be defined. Once the main parameters are known, an analytical simulation will be performed to minimize heat losses from the system. Nitrous oxide injection into the chamber will be optimized. Improvements to the thruster's design will be suggested to enhance performance. A final report will also be produced. The final report will describe the apparatus, test set-up and measurement techniques used for testing, contain the recorded values of pressures, temperatures, nitrous oxide mass flow rates, and discuss the results obtained. A proposal for further development and design of the nitrous oxide thruster will be presented.

DTIC

Nitrous Oxides; Decomposition; Catalysts; Spacecraft Propulsion; Chemical Propulsion

16

SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also 03 Air Transportation and Safety and 15 Launch Vehicles and Launch Vehicles, and 18 Spacecraft Design, Testing and Performance. For space suits, see 54 Man/System Technology and Life Support.

20010082536 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-105 Countdown Status Briefing

Aug. 07, 2001; In English; Videotape: 15 min. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001137226; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

Joel Wells, NASA Public Affairs, introduces Pete Nickolenko, NASA Test Director, Glen Chin, STS-105 Mission Manager, and Ed Priselac, Shuttle Weather Officer. They give an overview of the countdown to the STS-105 Discovery Orbiter launch, including details on prelaunch tests (activate and check on-board avionics software, payload bay closeout, prepare and clear launch pad, etc.), payload bay status (Leonardo Multipurpose Logistics Module), and the weather forecast. The men then answer questions from the press.

CASI

Countdown; Spacecraft Launching; Prelaunch Tests; Weather Forecasting; Prelaunch Summaries

20010084934 NASA Goddard Space Flight Center, Greenbelt, MD USA

Shuttle Small Payloads Project Office: Overview

Dunker, S. Chris, NASA Goddard Space Flight Center, USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 45p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the Shuttle Small Payload Project Office activities. Information is given on the Hitchhiker and Hitchhiker-Junior programs, the Get Away Special program, space experiment module program, program costs, and future enhancements.

CASI

Get Away Specials (STS); Project Planning; Space Shuttle Payloads

20010084951 Air Force Research Lab., USA

Military Spaceplane Overview for NRO Shareride Conference

Verderame, Ken, Air Force Research Lab., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 15p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the military spaceplane, including details on what its capabilities are, the system architecture, characteristics, configuration options, the X-40B program, and space surveillance.

CASI

Military Technology; Aerospace Planes

SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

20010084973 California Univ., Los Angeles, CA USA

Estimation of Wheel and CMG Alignments from On-Orbit Telemetry

Peck, Mason A., California Univ., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 187-201; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

Using an accurate estimate of the alignments of a spacecraft's actuators helps ensure efficient and precise maneuvers, particularly for missions that implement open-loop or feedforward input sequences. Often actuator alignments are estimated as small biases identified through Kalman filtering. This study takes a different approach. First, we acknowledge that alignment estimation is dual to attitude determination, the problem of finding the representation (or attitude) of one set of basis vectors relative to another. Existing attitude-determination techniques can be incorporated into the actuator-identification problem through an iterative solution. Dynamic parameters of the system and small-angle representations of the alignments are identified from measurement data via least-squares estimation. Then these parameters, along with the measurements, are used as vector observations for optimal attitude-determination for each alignment matrix of interest. The magnitude of the actuator torque applied at the instant of measurement serves as a weighting factor on the vector observation. If further iterations are necessary, the optimal alignments are used as inputs for a new iteration of the least-squares system identification step and new optimal alignments found. The iteration can be considered complete when the attitude-determination step returns identity rotations within some tolerance. This general method is applied explicitly to a class of problems: finding the alignments of control-moment gyros for a spinning spacecraft with unknown mass properties. The solution is demonstrated through simulations.

Author

Actuators; Alignment; Iterative Solution; Satellite Orientation

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see 54 Man/System Technology and Life Support. For related information, see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.

20010084631 NASA Marshall Space Flight Center, Huntsville, AL USA

Effects of Contamination, UV Radiation, and Atomic Oxygen on ISS Thermal Control Materials

Visentine, Jim, Boeing Co., USA; Finckenor, Miria, NASA Marshall Space Flight Center, USA; Zwiener, Jim, AZ Technology, Inc., USA; [2001]; 1p; In English; 33rd International SAMPE Technical Conference, 4-8 Nov. 2001, Seattle, WA, USA

Contract(s)/Grant(s): RTOP 478-88-50; No Copyright; Avail: Issuing Activity; Abstract Only

Thermal control surfaces on the International Space Station (ISS) have been tailored for optimum optical properties. The space environment, particularly contamination, ultraviolet (UV) radiation, and atomic oxygen (AO) may have a detrimental effect on these optical properties. These effects must be quantified for modeling and planning. Also of interest was the effect of porosity on the reaction to simulated space environment. Five materials were chosen for this study based on their use on ISS. The thermal control materials were Z-93 white coating, silverized Teflon, chromic acid anodized aluminum, sulfuric acid anodized aluminum, and 7075-T6 aluminum. Some of the samples were exposed to RTV 560 silicone; others were exposed to Tefzel offgassing products. Two samples of Z-93 were not exposed to contamination as clean "controls". VUV radiation was used to photo-fix the contaminant to the material surface, then the samples were exposed to AO. All samples were exposed to 1000 equivalent sun-hours (ESH) of vacuum ultraviolet radiation (VUV) at the AZ Technology facility and a minimum of 1.5×10^{20} atoms/sq cm of AO at Marshall Space Flight Center. Half of the samples were exposed to an additional 2000 ESH of VUV at Huntington Beach prior to sent to AZ Technology. Darkening of the Z-93 white coating was noted after VUV exposure. AO exposure did bleach the Z-93 but not back to its original brightness. Solar absorptance curves show the degradation due to contamination and VUV and the recovery with AO exposure. More bleaching was noted on the Tefzel-contaminated samples than with the RTV-contaminated samples.

Author

Aerospace Environments; Temperature Control; Optical Properties; Ultraviolet Radiation; Radiation Effects; Oxygen Atoms; Contamination

20010084937 Integrated Space Systems, Inc., San Diego, CA USA

Low-Cost Space Platform (Technology Demonstration, Earth Science, Earth Observation)

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 30p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

The mission objective is to combine low-cost, versatile small satellites together with a low cost launch system to provide the customer with consistent, rapid access to space. The program provides a standardized experiment platform for maximum experiment flexibility (1, 2, 3, or 4 stacked spacecraft for a total of 400 to 800 pounds of payload matching to the customer's mission). The equipment is launched on a low cost domestic launch vehicle for the lowest possible cost per mission.

Derived from text

Launch Vehicles; Spacecraft Launching; Space Platforms; Low Cost

20010084940 Ball Aerospace and Technologies Corp., USA

Small Platforms for Secondary Payloads

Schrepel, Terry, Ball Aerospace and Technologies Corp., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 16p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the small platforms for secondary payloads, including details on the SubSystem A, 'G' Test Demonstration, Multi-Purpose Experimental Canister, DARPASAT, Geosat Follow-On (GFO), LOSAT-X, BCP 2000, Multi-Spectral Thermal Imager, and QuickScat. Schematics show multiple payloads in various launch vehicles and spacecraft/fairing configurations.

CASI

Payloads; Spacecraft Configurations; Space Platforms

20010084941 Lockheed Martin Missiles and Space, USA

Lockheed Martin Missiles and Space (LMMS) Smallsat Capabilities

McNamara, Ed, Lockheed Martin Missiles and Space, USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 26p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

The LM100(tm) is derived from the Lunar Prospector spacecraft developed for NASA. It is a small, spin stabilized spacecraft with boom-mounted payloads, which are isolated from spacecraft. LM100 mission capabilities include small scientific payloads to GEO, low-earth orbits, and lunar orbits; a three year mission life; Deep Space Network (DSN) or Tracking and Data Relay Satellite System (TDRSS) compatible S-band Consultative Committee for Space Data Systems (CCSDS)-compatible communications; spacecraft and payload equipment mounting to primary bus structure; orbit maintenance provided by propulsion system; and upper stage compatibility.

Derived from text

Specifications; Spacecraft Configurations; Lunar Spacecraft

20010084943 Final Analysis, Inc., Lanham, MD USA

Quick Ride: An Innovative Approach for Low Cost, Quick Access Small Payload Missions

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 14p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of Quick Ride, an innovative approach for low cost, quick access small payload missions. Details are given on the program background, flight opportunities, range of accommodations, optional services, program plan, and a cost summary.

CASI

Project Planning; Artificial Satellites; Payloads

20010084945 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA

Student Micro/Nano Space Applications

Twiggs, Robert J., Stanford Univ., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 20p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the student micro/nano space applications. Details are given for educational goals and challenges, projects being worked on, and cost ranges. Several satellites are described, including the SAPPHIRE microsatellite, OPAL microsatellite, Artemis picosatellites, Stensat picosatellite, Emerald nanosatellites, Orion formation flying, and the Ares Mars Project.

CASI

Education; Microsatellites; Nanosatellites; Technology Utilization

20010084947 Spacehab, Inc., Washington, DC USA

Commercial Space Hardware Capabilities

Martin, Chris, Spacehab, Inc., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 22p; In English; See also 20010084928; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

SPACEHAB, Inc. is the leading commercial space services company supporting both manned and unmanned missions to space and was the first company to develop, own, and operate habitable modules that provide space-based laboratory research facilities and cargo re-supply services aboard the US Space Shuttle fleet. ASTROTECH offers customers a commercial alternative to the government payload processing facilities at the Kennedy Space Center with the full cooperation of NASA, provides payload processing for civil and commercial satellites, and is the leading commercial provider of launch processing services in the USA. Johnson Engineering is a highly diversified enterprise primarily engaged in design, development, fabrication, and integration of technology products and services. The company's core businesses include design engineering for electrical, mechanical, and software systems, aquatic/ocean engineering, fabrication, space systems, and systems integration.

Derived from text

Payload Integration; Commercialization

20010084948 Air Force Research Lab., Space Vehicle Technologies Branch, Kirkland AFB, NM USA

The nanoSat Payload Ejection System

Huybrechts, Steven, Air Force Research Lab., USA; Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 15p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the nanoSat payload ejection system. Details are given for the processing facilities, technologies of interest, the Emerald mission, ionospheric observation of nanoSat formation, the Constellation Pathfinder, and solar blade nanoSat solar sail.

CASI

Ejection; Nanosatellites; Payloads

20010084950 Aerospace Corp., El Segundo, CA USA

NASA's Pucksat Payload Adapter

Proceedings of the First Annual NRO-OSL/GSFC-ATS Rideshare Conference; October 1999; 37p; In English; See also 20010084928; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of NASA's Pucksat payload adapter, including details on the Pucksat concept, Pucksat design and payload configurations, major structural interfaces, user accommodations, milestones, cost and schedule, and lessons learned. The goal is to provide the Delta II second stage compatible standard structure capable of enabling a variety of science missions with a wide range of satellite configurations. Example missions and configurations are as follows: (1) Pucksat dedicated mission configuration; (2) Pucksat instrument carrier configuration; (3) Pucksat multiple payloads carrier configuration; and (4) Multiple Pucksats stacked configuration.

Derived from text

Adapters; Payloads; Satellite Configurations; Structural Design

20010084960 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Non-Linear Approach to Spacecraft Trajectory Control in the Vicinity of a Libration Point

Luquette, Richard J., NASA Goddard Space Flight Center, USA; Sanner, Robert M., Maryland Univ., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 15-24; In English; See also 20010084958; No Copyright; Avail: CASI; A02, Hardcopy

An expanding interest in mission design strategies that exploit libration point regions demands the continued development of enhanced, efficient, control algorithms for station-keeping and formation maintenance. This paper discusses the development of a non-linear, station-keeping, control algorithm for trajectories in the vicinity of a libration point. The control law guarantees exponential convergence, based on a Lyapunov analysis. Controller performance is evaluated using FreeFlyer(R) and MATLAB(R) for a spacecraft stationed near the L2 libration point in the Earth-Moon system, tracking a pre-defined reference

trajectory. Evaluation metrics are fuel usage and tracking accuracy. Simulation results are compared with a linear-based controller for a spacecraft tracking the same reference trajectory. Although the analysis is framed in the context of station-keeping, the control algorithm is equally applicable to a formation flying problem with an appropriate definition of the reference trajectory.

Author

Algorithms; Computerized Simulation; Spacecraft Trajectories; Trajectory Control

20010084975 Carr Astronautics Corp., Washington, DC USA

A Long-Term Characterization of GOES I-M Attitude Errors

Harris, Joe, Carr Astronautics Corp., USA; Carr, Jim, Carr Astronautics Corp., USA; Chu, Don, Swales Aerospace, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 217-228; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

A year of Geostationary Operational Environmental Satellite (GOES)-8 and GOES-10 in-flight data is analyzed to characterize long-term GOES attitude errors. GOES Imager payload star sensing is the primary means of observing attitude. Attitude is estimated for each star window and the diurnally repeatable and nonrepeatable components of the attitude error are determined. The diurnally repeatable component is due to thermal distortions of the spacecraft and instruments. It evolves slowly with the seasons. The nonrepeatable component is due to the response of the Earth sensor, used by the GOES attitude control system, to infrared radiance gradients and cold clouds near the Earth limb.

Author

Error Analysis; GOES Satellites; Satellite Orientation; Computerized Simulation

20010084980 Spectrum Astro, Inc., USA

Global Lyapunov Control of Spin Stabilized Spacecraft

Reynolds, Reid, Spectrum Astro, Inc., USA; Creamer, Glenn, Naval Research Lab., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 285-293; In English; See also 20010084958; No Copyright; Avail: CASI; A02, Hardcopy

Spin stabilization is the most basic technique available for the control of spacecraft. However, analyses of control laws for spin rate and spin axis precession often rely on linearization theory or heuristic arguments. In this paper, we introduce a new Lyapunov based control strategy for simultaneous spin, nutation, and precession control, which guarantees a continual downward trend to a unique, global minimum in the specified control cost. A variety of actuators may be used to implement the control scheme, including thrusters and magnetic torquers, and we examine practical implementation issues for each of these. Outstanding performance is demonstrated via simulations.

Author

Control Theory; Spacecraft Control; Spin Stabilization; Liapunov Functions

20010084982 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Two-Wheel Observing Mode for the MAP Spacecraft

Starin, Scott R., NASA Goddard Space Flight Center, USA; ODonnell, James R., Jr., NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 311-325; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The Microwave Anisotropy Probe (MAP) is a follow-on to the Differential Microwave Radiometer (DMR) instrument on the Cosmic Background Explorer (COBE). Due to the MAP project's limited mass, power, and budget, a traditional reliability concept including fully redundant components was not feasible. The MAP design employs selective hardware redundancy, along with backup software modes and algorithms, to improve the odds of mission success. This paper describes the effort to develop a backup control mode, known as Observing II, that will allow the MAP science mission to continue in the event of a failure of one of its three reaction wheel assemblies. This backup science mode requires a change from MAP's nominal zero-momentum control system to a momentum-bias system. In this system, existing thruster-based control modes are used to establish a momentum bias about the sun line sufficient to spin the spacecraft up to the desired scan rate. Natural spacecraft dynamics exhibits spin and nutation similar to the nominal MAP science mode with different relative rotation rates, so the two reaction wheels are used to establish and maintain the desired nutation angle from the sun line. Detailed descriptions of the ObservingII control algorithm and simulation results will be presented, along with the operational considerations of performing the rest of MAP's necessary functions with only two wheels.

Author

Algorithms; Computerized Simulation; Reaction Wheels; Redundancy

20010084985 Bauer Engineering Enterprises, Langhorne, PA USA

Uniform Sampling of SO3

Bauer, Robert, Bauer Engineering Enterprises, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 347-359; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

Uniformly distributed samples of SO3 are needed to make an objective assessment of spacecraft attitude control performance over all attitudes. Random sampling algorithms are reviewed and stratified sampling algorithms are derived. Random sampling distributes samples in a probabilistic sense: the probability that a sample lies in any given region of SO3 is directly proportional to the size of the region. Uniformly stratified sampling distributes samples in a geometric sense: SO3 is partitioned into equal-size and nearly cubic cells and then a sample is placed at the center of each cell. Measure and probability theory on SO3 is reviewed and used to define uniformity, verify the uniformity of the random sampling, and develop the stratified sampling algorithms. Statistical tests are used to validate the sampling algorithms as implemented.

Author

Algorithms; Random Sampling; Satellite Attitude Control; Spatial Distribution; Sulfur Oxides

20010084988 Computer Sciences Corp., USA

Tracking and Data Relay Satellite (TDRS-3) Range Biases and Momentum Unload Modeling for Terra (EOS-AMI)

Ward, Douglas T., Computer Sciences Corp., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 393-407; In English; See also 20010084958

Contract(s)/Grant(s): NAS9-98100; No Copyright; Avail: CASI; A03, Hardcopy

The Flight Dynamics Facility (FDF) reports its performance in meeting Tracking and Data Relay Satellite (TDRS) predicted ephemeris accuracy requirements with TDRS-3. The Terra (Earth Observing System AM-1) satellite has 3-sigma TDRS requirements of 75 m for total position accuracy predicted over one day onboard. The study sample includes selected cases over 21 months after Guam Remote Ground Terminal (GRGT) support started in June 1998. For daily solutions with a 1.5-day prediction span, predicted results of the study were below the Terra requirement by at least 12 m. Refined range bias estimation and modeled momentum unloads are needed to meet Terra's requirements for TDRS-3. Maintained at 275 W longitude over the zone of exclusion, TDRS-3 is analyzed separately from other TDRSs because of its unique tracking data. Only the Bilateral Ranging Transponder (BRT) at Alice Springs (ALS), Australia, and the Telemetry, Tracking and Command (TT&C) system at Guam are used for routine operational tracking data for TDRS-3. Simultaneous batch orbit solutions with three TDRSs and either the Compton Gamma Ray Observatory (GRO) or Terra were done with the Goddard Trajectory Determination System (GTDS) to periodically refine the TT&C and BRT System (BRTS) range biases. As new biases were determined, significant changes were made in estimating the absolute position. FDF achieved similar results using a sequential filter with all operational TDRSs and four user satellites. Definitive accuracy (3-sigma) is expected to be below 50 m. The White Sands Complex (WSC) performs momentum unloads to maintain three-axis stabilized attitude of TDRSs. The relationship between velocity changes (delta-V) and reaction wheel speed changes was empirically determined for roll/yaw unloads. A theoretical relationship was verified and used for pitch unloads. Modeling both pitch and roll/yaw momentum unloads is necessary to meet the 75-m requirement. Moving the orbit solution epoch an hour before a momentum unload can improve delta-V optimization and prediction accuracy over 1.5 days.

Author

Bias; Momentum; TDR Satellites; Computerized Simulation; Satellite Orientation

20010085349 Norwegian Defence Research Establishment, Kjeller, Norway

Comparison of RADARSAT and IKONOS Satellite Images: Detection and Visibility of Man-Made Objects

Bretar, Frederic, Norwegian Defence Research Establishment, Norway; Weydahl, Dan Johan, Norwegian Defence Research Establishment, Norway; Apr. 30, 2001; 60p; In English; Original contains color illustrations

Contract(s)/Grant(s): FFIE Proj. 763/170

Report No.(s): FFI/RAPPORT-2001/02351; ISBN 82-464-0522-5; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report compares the visual appearance and detection of different man-made objects in an area close to Bergen city in Norway using IKONOS (1 m resolution) and RADARSAT (9 m resolution) images respectively. The results show that the RADARSAT images add very limited information to the IKONOS panchromatic image for many mapping applications. One explanation for the seeming lack of information from the SAR data in this study, is that the IKONOS sensor images the Earth's ground with a resolution of 1 m, while the RADARSAT Fine mode only has 9 m resolution. Despite these matters, this study also shows that RADARSAT may sometimes uniquely detect certain objects: some buildings gave a strong backscatter even if they were partly hidden in the forest, buoys may very well be detected on a low SAR backscatter ocean surface, parked helicopters and airplanes were represented as bright points, electrical wires laid out in a direction favourable to the incidence radar beam.

There are also examples that strong RADARSAT backscatter may confirm the presence of bridges as well as building structures/forms already seen in the IKONOS image.

Author

Backscattering; Radarsat; Synthetic Aperture Radar; Satellite Observation; Radar Imagery

20010089252 Swales Aerospace, Beltsville, MD USA

Structural Qualification Testing of the WindSat Payload Using Sine Bursts Near Structural Resonance

Pontius, Jim, Swales Aerospace, USA; Barnes, Donald, Swales Aerospace, USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Sine burst tests are often used for structural qualification of space flight hardware. In most instances, the driving frequency of the shaker is specified far below the structure's first resonant mode, such that the entire test article sees uniform acceleration. For large structures, this limits qualification testing to lower parts of the structure, or else it over-tests the lower structure to achieve qualification of the upper structure. The WindSat payload, a 10.5 foot tall graphite/epoxy, titanium, and aluminum radiometer, experiences accelerations at the six foot diameter reflector nearly four times that at the spacecraft interface. Due to size of the payload, the number of bonded joints, and the lightweight reflector support structure design and construction, using static pull testing to qualify all of the bonded joints in the upper structure would result in large, expensive, and extensive test fixturing. Sine burst testing near the first two structural resonant modes was performed on the WindSat payload to achieve the correct load factor distribution up the stack for structural qualification. In this presentation, how finite element method (FEM) sine burst predictions were used in conjunction with low level random and sine burst tests to achieve correct qualification test load factor distribution on the WindSat payload is discussed. Also presented is the risk mitigation approach for using the uncorrelated FEM in this procedure.

Author

Performance Tests; Qualifications; Structural Analysis; Radiometers

19

SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also 06 Aircraft Instrumentation and Avionics; For spaceborne instruments not integral to the vehicle itself see 35 Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy, Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy.

20010084974 ITT Industries, Inc., Fort Wayne, IN USA

Validating GOES Instrument Thermal Deformations

Harter, Peter, ITT Industries, Inc., USA; Ghaffarian, Benny, ITT Industries, Inc., USA; Ng, Ray, Boeing Satellite Systems, Inc., USA; Pugh, Brett, Boeing Satellite Systems, Inc., USA; Wilkin, Paul, Swales Aerospace, USA; Sayal, Chetan, Swales Aerospace, USA; Chu, Don, Swales Aerospace, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 203-215; In English; See also 20010084958

Contract(s)/Grant(s): NAS5-01090; No Copyright; Avail: CASI; A03, Hardcopy

Comparison of the Geostationary Operational Environmental Satellite (GOES) instrument thermal model predictions with on-orbit data shows that the models capture the observed temperature and misalignment trends. Lack of precise knowledge as to spacecraft pointing precludes such comparison with instrument pointing predictions. Based on the models, thermally induced instrument attitude variation will dominate GOES N-Q Image Motion Compensation (IMC). Errors due to day-to-day changes in the attitude profiles are predicted to be under 10 microradians except for rapid scans where disturbances may reach 30 microradians.

Author

Satellite Orientation; Misalignment; Temperature Effects; Trends

20010084978 NASA Goddard Space Flight Center, Greenbelt, MD USA

State-Dependent Pseudo-Linear Filter for Spacecraft Attitude and Rate Estimation

Bar-Itzhack, Itzhack Y., NASA Goddard Space Flight Center, USA; Harman, Richard R., NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 259-269; In English; See also 20010084958; No Copyright; Avail:

CASI; A03, Hardcopy

This paper presents the development and performance of a special algorithm for estimating the attitude and angular rate of a spacecraft. The algorithm is a pseudo-linear Kalman filter, which is an ordinary linear Kalman filter that operates on a linear model whose matrices are current state estimate dependent. The nonlinear rotational dynamics equation of the spacecraft is presented in the state space as a state-dependent linear system. Two types of measurements are considered. One type is a measurement of the quaternion of rotation, which is obtained from a newly introduced star tracker based apparatus. The other type of measurement is that of vectors, which permits the use of a variety of vector measuring sensors like sun sensors and magnetometers. While quaternion measurements are related linearly to the state vector, vector measurements constitute a nonlinear function of the state vector. Therefore, in this paper, a state-dependent linear measurement equation is developed for the vector measurement case. The state-dependent pseudo linear filter is applied to simulated spacecraft rotations and adequate estimates of the spacecraft attitude and rate are obtained for the case of quaternion measurements as well as of vector measurements.

Author

Algorithms; Angular Velocity; Satellite Orientation; Computerized Simulation

20010084979 NASA Goddard Space Flight Center, Greenbelt, MD USA

Triana Safehold: A New Gyroless, Sun-Pointing Attitude Controller

Chen, J., K and D Research, USA; Morgenstern, Wendy, NASA Goddard Space Flight Center, USA; Garrick, Joseph, NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 271-283; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

Triana is a single-string spacecraft to be placed in a halo orbit about the sun-earth L1 Lagrangian point. The Attitude Control Subsystem (ACS) hardware includes four reaction wheels, ten thrusters, six coarse sun sensors, a star tracker, and a three-axis Inertial Measuring Unit (IMU). The ACS Safehold design features a gyroless sun-pointing control scheme using only sun sensors and wheels. With this minimum hardware approach, Safehold increases mission reliability in the event of a gyroscope anomaly. In place of the gyroscope rate measurements, Triana Safehold uses wheel tachometers to help provide a scaled estimation of the spacecraft body rate about the sun vector. Since Triana nominally performs momentum management every three months, its accumulated system momentum can reach a significant fraction of the wheel capacity. It is therefore a requirement for Safehold to maintain a sun-pointing attitude even when the spacecraft system momentum is reasonably large. The tachometer sun-line rate estimation enables the controller to bring the spacecraft close to its desired sun-pointing attitude even with reasonably high system momentum and wheel drags. This paper presents the design rationale behind this gyroless controller, stability analysis, and some time-domain simulation results showing performances with various initial conditions. Finally, suggestions for future improvements are briefly discussed.

Author

Satellite Orientation; Attitude Control; Control Systems Design; Controllers; Pointing Control Systems

20010084999 Computer Sciences Corp., Lanham, MD USA

On-Orbit Performance of Autonomous Star Trackers

Airapetian, V., Computer Sciences Corp., USA; Sedlak, J., Computer Sciences Corp., USA; Hashmall, J., Computer Sciences Corp., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 545-557; In English; See also 20010084958

Contract(s)/Grant(s): GS-35F-4381G; NASA Order S-43411-G; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents the results of a performance study of the autonomous star trackers (ASTs) on the IMAGE and the EO-1 spacecraft. IMAGE is a spinning spacecraft without gyros or redundant precision attitude sensors, so the statistical properties of the AST are estimated simply by comparing the output observed quaternions with a rigid rotator model with constant angular momentum. The initial conditions are determined by a least-squares fit to minimize the AST residuals. An additional fit is used to remove the remaining systematic error and to obtain the inherent sensor noise. Gyro rate data are available for the EO-1 mission, so the AST noise statistics are obtained from the residuals after solving for an epoch attitude and gyro bias also using a least-squares method.

Author

Star Trackers; Autonomy; Spacecraft Performance

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also 07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations; and 44 Energy Production and Conversion.

20010084627 NASA Marshall Space Flight Center, Huntsville, AL USA

Simulation of MC-1 Engine on Real-Time Station

Ly, William, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; ADIUS 2001, 10-13 Jun. 2001, Ann Arbor, MI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The MC-1 rocket engine is a new, 60,000-pound-thrust engine designed to boost small spacecraft carrying payloads weighing up to 500 pounds. The engine was designed in-house at NASA's Marshall Space Flight Center (MSFC) in Huntsville, Alabama, and built by SUMMA Technology, Inc. A vital part of the success of the engine development was the verification of the Propulsion System Controller (PSC) used to control the MC-1 engine during development testing at test facilities in Mississippi and California. The MC-1 engine simulation software was developed on the Applied Dynamics, Inc.'s Real-Time Station (RTS) computer system (ESL) to verify the PSC's hardware and software performance in the Marshall Avionics System Testbed's (MAST) Engine Simulation Lab at the MSFC. The engine model includes the simulation of pressure transducers, thermocouple sensors and valve-positions.

Author

Computerized Simulation; Engine Design; Rocket Engines; Real Time Operation; Controllers

20010084986 Hammers Co., USA

Getting the Most Out of Four Thrusters on the Earth Observing-1 Spacecraft

Blackman, Kathie, Hammers Co., USA; Hunt, Teresa, Swales Aerospace, USA; Sanneman, Paul, Swales Aerospace, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 361-375; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

The NASA New Millennium Program (NMP) Earth Observing-1 (EO-1) spacecraft was launched in November 2000 on its primary mission to validate advanced remote sensing instruments. One of the critical mission requirements is formation flying with respect to the Landsat-7 mission for instrument image comparison. Due to the nature of the small spacecraft design, only four thrusters could be accommodated on the EO-1 spacecraft. This presented a challenge to the design of the Delta-V controller. This paper presents the design, development, and on-orbit performance of this thruster based control mode. The control algorithm utilizes an a-priori open loop firing pattern combined with closed loop feedback control. The observed attitude performance has been well within the five degree requirement, and the delivered Delta-V has been within 1% of the goal. This success will allow the EO-1 Enhanced Formation Flying experiment to proceed with a higher degree of accuracy and precision than would have otherwise been possible.

Author

Satellite Orientation; Feedback Control; Algorithms

20010085350 Air Force Research Lab., Space Vehicles Directorate, Hanscom AFB, MA USA

The Feasibility of Missile Launch Detection Through Clouds Using the 589.6 nm Na Emission

Ahmadjian, M.; Huppi, E. R.; Egan, M.; Smith, D. R.; Ratkowski, A. J.; Jan. 1999; 14p; In English Report No.(s): AD-A390450; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Spectral measurements of various solid and liquid propellant rocket plumes have shown the presence of strong emissions from sodium (589.6 nm) and potassium (766.5 nm). Theoretical calculations indicate that emissions near 589.6 nm should be efficiently transmitted through the atmosphere and clouds and thus should be easily detectable by a downward-looking sensor positioned above the clouds. To test this concept, a visible radiometric sensor with an interference filter (and later with an atomic line resonance filter) was developed and flown on an aircraft platform. A simple ground-based Na emission source was fabricated using several low-pressure sodium discharge lamps. A number of nighttime measurement flights were conducted for several different cloud types and conditions. Data collected during these nighttime flights are presented and discussed. These initial measurements have confirmed that a simulated rocket emission source at 589.6 nm is detectable through clouds. Additional measurements covering a wider range of cloud conditions and types and during daylight conditions are planned for the near future.

DTIC

Missile Detection; Radiometers; Sensors

20010086424 Science Applications International Corp., Huntsville, AL USA

Second Generation RLV Program Monthly Report, 20 Jan. - 16 Feb. 2001

Laue, Jay, Science Applications International Corp., USA; Feb. 26, 2001; 12p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS8-99060; NRA8-21

Report No.(s): NAS8-99060-MPR26; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the time period covered by this report, SAIC: 1) Continued to develop and assess processes and approaches that can be applied to Second Generation Reuseable Launch Vehicles (RLV) technologies prioritization. An approach based on the use of analytic Saaty scale functions has been defined and is being investigated. 2) Planned and facilitated technologies prioritization workshops, supported development of systems program algorithms based on the concept of influence diagramming, and assessment of analogies between aircraft and space systems developments. 3) Video interviews held with X-37 personnel at Dryden. The CD-ROM is being concluded and a near-final review disc is expected soon. 4) CD-ROMS were produced by Engineered Multimedia, Inc. (EMI) under subcontract to SAIC. These two CD-ROM products, "Microgravity" and "New Horizons", were delivered to MSFS technical representatives at a briefing at SAID on January 18, 2001. 5) Presentation brochure, "Aviation/Space Analog Team Interim Report" was provided to Space Propulsion Synergy Team (SPST) members and to NASA personnel. Wrap-up of effort will be a mid-April briefing to both MSFC and the full SPST membership. Support to Phase 2 of CCPD ends 3/31/01. Phase 3 continuation effort planned with emphasis on technical info content. 6) Recommended that eliminating the B-52 flights of the X-37 in favor of alternate approach be evaluated. Discovered that a required change to the thruster valves of the X-37 had not been made. Repair work continues on the lower fuselage section of the X-37, in the areas that experienced core collapse. The currently catalogued potential weight increases and decreases are about equal, but this does not include the impact of the cable weight underestimate reported earlier. The CFD for RCS testing correlates well with the wind tunnel data. 7) The Level IV CCB approved SCN-4 to the MC-1 Engine Specification. Approved changes have been incorporated into the specification, and Revision D has been released to the Repository. Billy Gonterman, SAIC, traveled to SSC to perform a five-day readiness assessment on the progress of facilities activation. Implemented modifications to the MC-1 Engine TPA Component Database. 8) Replaced 25 Combined-Cycle Propulsion Database (CCPD) documents; modified the low-on screen to include a direct email link for user contact; prepared a summary presentation of current and proposed tasks.

Derived from text

Reusable Launch Vehicles; Microgravity; X-37 Vehicle; Combined Cycle Power Generation; Spacecraft Propulsion; Systems Engineering; Rocket Engines

20010086959 Rockwell International Corp., Canoga Park, CA USA

Nuclear Rocket Propulsion Application

Dunn, C., Rockwell International Corp., USA; [1963]; 29p; In English; ASME Aviation and Space, Hydraulic, Gas Turbine Conference, 3-7 Mar. 1963, Los Angeles, CA, USA; Sponsored by American Society of Mechanical Engineers, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As goals for the space program beyond the Apollo project are considered, an interesting candidate is a Mars fly-by. Duration of the trip can be reduced to approximately 1 year, although energy requirements are high, and a minimum number (perhaps only one) of propulsive maneuvers are required. Ideal velocity increments from low-altitude orbit range from 25,000 to 40,000 ft/sec, depending upon launch date. During 1971, energy requirements are at the low side of this range, and schedules indicate that the solid heat exchanger nuclear rocket will be a prime candidate for the propulsion system. Engine sizing for such systems is important from the aspects of development and cost. Basic component operating conditions are important with regard to system performance and to goals which should be established for certain component state-of-the-art programs. The out-of-orbit propulsion engine may be used to advantage in the boost vehicle if scheduling and cost effectiveness are attractive. Application to other competing missions and the above considerations may dictate a best compromise engine from an economic standpoint.

Author

Rocket Engine Design; Nuclear Propulsion; Nuclear Rocket Engines; Propulsion System Configurations; Spacecraft Propulsion; Weight Analysis; Propulsion System Performance; Thrust-Weight Ratio; Acceleration (Physics); Engine Parts

20010086984 NASA Goddard Space Flight Center, Greenbelt, MD USA

Validation Report for the EO-1 Lightweight Flexible Solar Array Experiment

Carpenter, Bernie, Lockheed Martin Astronautics, USA; Lyons, John, NASA Goddard Space Flight Center, USA; [2001]; 8p; In English; EO-1 Technology Infusion Forum, 15-16 Aug. 2001, Greenbelt, MD, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The controlled deployment of the Lightweight Flexible Solar Array (LFSA) experiment using the shape memory alloy release and deployment system has been demonstrated. Work remains to be done in increasing the efficiency of Copper Indium Diselenide (CIS) terminations to the flexible harness that carries current from the array to the I-V measurement electronics.

Author

Shape Memory Alloys; Solar Arrays; Deployment

20010088088 Minnesota Univ., Dept. of Aerospace Engineering and Mechanics, Minneapolis, MN USA

Simulation of Nonequilibrium Rocket Motor Plumes Final Report, 22 Sep. 1997 - 21 Sep. 2000

Candler, Graham V.; May 11, 2001; 31p; In English; Original contains color plates

Contract(s)/Grant(s): DAAG55-97-1-0406

Report No.(s): AD-A390688; ARO-37556.3-EG-SDI; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The research used parallelized computational fluid dynamics methods to make high fidelity simulations of thermo-chemical nonequilibrium flows in rocket motor plumes. This work had two main topics: recent thermal radiative emission experimental data from an Atlas launch were analyzed using a thermo-chemical model with finite-rate internal energy relaxation and chemical reactions. In addition, a detailed analysis of high-temperature flow fields were performed using a vibrational and electronic state-specific excitation model. The simulation results were then used to compute the ultraviolet and infrared radiation emitted from the high-temperature flows to compare with the recent measurements.

DTIC

Plumes; Rocket Engines; Simulation; Nonequilibrium Flow

20010088780 Rockwell International Corp., System Analysis Nuclonics, Canoga Park, CA USA

A Survey of Gaseous Fuel Nuclear Rocket Propulsion, Volume 1

Jones, Carmen B., Rockwell International Corp., USA; February 1964; 70p; In English; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This survey of gaseous fuel nuclear rocket propulsion is intended to provide a compendium of, and guide to, pertinent literature on the subject. A brief treatment is given for each of several major aspects of gaseous fuel propulsion with regard to existing art, outstanding problems, plus immediate and long term prospects. The principal existing research programs are noted, and commented upon in varying detail, as available information warrants. Three areas of possible Rocketdyne participation in gaseous fuel propulsion research are suggested,

Author

Nuclear Propulsion; Gaseous Rocket Propellants; Hydrogen Fuels; High Temperature Propellants; Exhaust Gases; Gas Temperature; Cooling Systems; Fuel Flow; Fuel Systems; Heat Transfer

23

CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see categories 24 through 29. For astrochemistry see category 90 Astrophysics.

20010084623 NASA Ames Research Center, Moffett Field, CA USA

Using Hydrogen and Chlorine on Si(111) to Store Data

Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; [2000]; 1p; In English

Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

The interaction of a pyridine molecule with H and Cl atoms on a Si(111) surface is studied using a cluster model in conjunction with the B3LYP/6-3 1G level of theory. Regardless of the type of the neighboring atoms, the interaction of the pyridine with a hydrogen atom is very different from its interaction a chlorine atom. This system is discussed in terms of our atomic data storage proposal.

Author

Hydrogen; Hydrogen Atoms; Silicon Compounds

20010084633 NASA Ames Research Center, Moffett Field, CA USA

Infrared Spectra and Density Functional Calculations on Binary Unsaturated Transition Metal Carbonyl Cations, Neutrals and Anions

Zhou, Mingfei, Fudan Univ., China; Bauschlicher, Charles W., NASA Ames Research Center, USA; Andrews, Lester, Virginia Univ., USA; [2000]; 1p; In English

Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

The status of theory and experiment for the determination of the CO vibrational frequencies in binary unsaturated transition metal carbonyl cations, neutrals and anions is reviewed.

Author

Infrared Spectra; Computation; Numerical Analysis; Carbonyl Compounds

20010084788 NASA Ames Research Center, Moffett Field, CA USA

Infrared Spectra of Polycyclic Aromatic Hydrocarbons (PAHs)

Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Bakes, E. L. O., NASA Ames Research Center, USA; [2000]; 1p; In English

Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

We have computed the synthetic infrared spectra of some polycyclic aromatic hydrocarbons containing up to 54 carbon atoms. The species studied include ovalene, circumcoronene, dicoronylene, and hexabenzocoronene. We report spectra for anions, neutrals, cations, and multiply charged cations.

Author

Infrared Spectra; Computation; Polycyclic Aromatic Hydrocarbons

20010084789 NASA Ames Research Center, Moffett Field, CA USA

The Reactions of Polycyclic Aromatic Hydrocarbons with OH

Ricca, Alessandra, NASA Ames Research Center, USA; Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; [2000]; 1p; In English

Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

The OH radical adds to naphthalene and naphthalene cation without a barrier. For the neutrals, the most favorable path for this intermediate is the loss of the OH, and the next most favorable option is the loss of an H atom to form the alcohol. For the cation, the most favorable path appears to be a hydrogen migration followed by the loss of a hydrogen to form the alcohol. The OH at carbon atom 1 is energetically most favorable for both the initial complex and final product. This is true for both the neutrals and cations.

Author

Hydroxyl Radicals; Naphthalene; Chemical Reactions

20010085390 Massachusetts Inst. of Tech., Dept. of Chemical Engineering, Cambridge, MA USA

Processing and Deposition of Nanocrystalline Oxide Composites for Thermal Barrier Coatings *Progress Report, 1 Jan. - 30 Jun. 2001*

Ying, Jackie Y.; McCue, Justin T.; Jun. 2001; 10p; In English

Contract(s)/Grant(s): N00014-95-1-0626

Report No.(s): AD-A392792; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes the synthesis and thermal stability of nanocrystalline oxide composites for thermal barrier coating applications. Nanocomposite powders were coated onto nickel-based substrates using alumina gel both as an interlayer and as an adhesive additive in subsequent Al₂O₃-Y₂O₃-ZrO₂ coatings. Prior to coating of the nanocomposite powders, bond coats were applied to the nickel substrates by plasma spraying. The effects of alumina content and pretreatment conditions on the thermal stability of the coatings were investigated. Thermal gravimetric analysis and optical microscopy experiments were performed to better understand the mechanism of failure in the thermal barrier coatings and determine the optimal coating composition and pretreatment conditions.

DTIC

Composite Materials; Single Crystals; Thermal Control Coatings; Thermal Stability

20010086583 Oak Ridge National Lab., TN USA

Micro-Structuring of Silicon by Pulsed-Laser Ablation Under Reactive Atmospheres

Jesse, S.; Pedraza, A. J.; Fowlkes, J. D.; Budai, J. D.; Lowndes, D. H.; 2001; 10p; In English

Report No.(s): PB2001-106597; No Copyright; Avail: National Technical Information Service (NTIS)

Micro-holes hundreds of mm-deep below the initial surface surrounded by 40-microns-tall micro-cones protruding over the initial surface form in silicon as a response to multiple UV pulsed-laser irradiation in an SF(sub 6) atmosphere. The micro-holes and micro-cones are arranged in a characteristic ensemble displaying a self-organized pattern. Similarly, deep-holes and micro-column ensembles form when the irradiation is performed in an oxygen-rich atmosphere. The formation mechanism of microcolumns and microcones in these reactive atmospheres has been studied using scanning electron microscopy, profilometry and x-ray diffraction. The growth of cones under SF(sub 6) atmospheres was studied in-situ using an ICCD gated camera coupled to a long distance microscope. The images obtained with the ICCD camera show that the fluorescent plume is correlated with the amount of ablated material. There is also a strong correlation between the plume and the growth of the cones. The cones grow in the region where the laser-generated plume is intense. When the flux of silicon-rich material ceases because the holes are very deep the balance between redeposition and ablation is tilted toward the latter and the cones begin to recede. Laser ablation is not only a function of the nominal fluence but also of the surface roughness and microstructure. These results strongly support the growth mechanism whereby laser-ablated silicon-rich molecules and clusters are transported to the tip and side of the cones by the laser-generated plasma.

NTIS

Silicon; Ablation; Laser Ablation; Ultraviolet Lasers; Pulsed Lasers

20010087778 Los Alamos National Lab., NM USA

Explosive Compaction of Clad Graphite Powders and Obtaining of Coatings on their Base

August 2000; 16p; In English

Report No.(s): DE2001-768177; LA-UR-00-4018; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In order to consolidate graphite based powders and in order to obtain coatings with density values near to the theoretical ones clad graphite powders were explosively compacted under different loading conditions. Theoretical calculations revealed that for assessing the stress deformed state of C - Ni compositions and computing the normal and tangent stress components. The structure and properties of the coatings depends on the intensity of the shock loading and temperature. The effect of the shock loading conditions (temperature, loading intensity) on the structure, properties and structure/properties relationships for the C - Ni coatings are discussed.

NTIS

Graphite; Cladding; Powder (Particles); Coating; Explosive Forming

24

COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20010084458 Massachusetts Inst. of Tech., Dept. of Mechanical Engineering, Cambridge, MA USA

Role of Controlled Debonding Along Fiber/Matrix Interfaces in the Strength and Toughness of Both Aligned and Unaligned-Fiber/Metal-Matrix Composites *Final Report, 15 Jan. 1997-31 Dec. 2000*

Argon, A. S.; Dec. 2000; 19p; In English

Contract(s)/Grant(s): F49620-97-1-0347

Report No.(s): AD-A392677; AFRL-SR-BL-TR-01-0415; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In certain metal matrix composites, and specifically in Al alloy aligned fiber Al₂O₃ composites the debonding response of interfaces adjacent to fiber fractures, in mixed tension and shear has important influences in the strength and toughness of the composite. Coarsening of interface precipitates offers close control of the level of debonding on such interfaces. In the present research computational models were developed for the interface debonding response under mixed tension/shear: fraction/separation response of the interfaces. Additional experiments were also performed on a prototype composite of Al with Al₂O₃ fiber preforms which demonstrated quite considerable toughening effects by fiber bridging in the arranged samples.

DTIC

Debonding (Materials); Fiber Composites; Metal Matrix Composites; Fiber-Matrix Interfaces; Fractures (Materials); Toughness

20010084461 Galaxy Scientific Corp., Egg Harbor Township, NJ USA

Evaluation of the Probabilistic Design Methodology and Computer Code for Composite Structures *Final Report*

Shiao, MiMichael; Jun. 2001; 34p; In English

Contract(s)/Grant(s): DTFAA03-95-D-00035

Report No.(s): AD-A392690; DOT/FAA/AR-99/12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the results of an independent evaluation on the numerical accuracy and computational efficiency of a probabilistic design methodology for composite aircraft structures. The methodology was developed by Northrop-Grumman Commercial Aircraft Division (NGCAD) under the Federal Aviation Administration (FAA) funding through Interagency Agreement DTFA03-94-A-40021, while the associated PC-based computer code MONTE was developed through FAA Grant 96-G-0036 with the University of Texas at Arlington. The probability calculation of NGCAD's probabilistic methodology is based on the conditional expectation method (CEM) to determine the failure probability of a specified failure event. This methodology was first verified by traditional Monte Carlo simulation (MCS) method using the computer code NESSUS developed by the National Aeronautical and Space Administration (NASA). Since Monte Carlo simulation is not efficient for small probability calculation, a mixed probabilistic method (MPM) was developed in this study to verify the results from MONTE in the 10^{-6} or less probability level. The mixed probabilistic method requires a decomposition of the overall failure function into several conditional failure functions. The probability of failure for each conditional failure function is first calculated using the CEM. The overall failure probability is then computed using the probability integration method (PIM). The mixed probabilistic method is implemented in the computer code NESSUS. Structural reliability analyses were conducted on the wing box of a Lear Fan aircraft using the computer codes MONTE and NESSUS with MCS and MPM. The results from all the codes were compared. The comparison indicates that NGCAD probabilistic composite design methodology uses fewer random simulations than that for traditional Monte Carlo simulation method for an accurate probability prediction. The computational time was reduced by about an order of magnitude.

DTIC

Computer Programs; Composite Structures; Monte Carlo Method; Aircraft Structures; Structural Reliability

20010084785 California Univ., Dept. of Mechanical and Aerospace Engineering, Los Angeles, CA USA

The Effect of Loading Parameters on Fatigue of Composite Laminates, Part 5 *Final Report*

Han, H. T.; Choi, S. W.; Jun. 2001; 64p; In English

Contract(s)/Grant(s): FAA-95-G-021

Report No.(s): PB2001-107612; DOT/FAA/AR-01/24-Pt-5; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report is the fifth in a series of reports on the damage growth of notched and visible impact-damaged AS4/3501-6 graphite/epoxy quasi-isotropic laminates under long-term mechanical fatigue loading. The effects of load type, load level, load sequence, and spectrum modification are evaluated in this study. X-ray radiography is taken of the test specimens to monitor the fatigue damage, which are in the form of splitting and delamination around the center hold of a specimen.

NTIS

Graphite-Epoxy Composites; Delaminating; Loads (Forces); Impact Tests; Fatigue (Materials)

20010085361 NASA Langley Research Center, Hampton, VA USA

Approach and Issues Relating to Shield Material Design to Protect Astronauts from Space Radiation

Wilson, J. W., NASA Langley Research Center, USA; Cucinotta, F. A., NASA Johnson Space Center, USA; Miller, J., Department of Energy, USA; Shinn, J. L., NASA Langley Research Center, USA; Thibeault, S. A., NASA Langley Research Center, USA; Singleterry, R. C., NASA Langley Research Center, USA; Simonsen, L. C., NASA Langley Research Center, USA; Kim, M. H., National Academy of Sciences - National Research Council, USA; Materials and Design; 2001; ISSN 0261-3069; Volume 22, pp. 541-554; In English; Copyright; Avail: Issuing Activity

One major obstacle to human space exploration is the possible limitations imposed by the adverse effects of long-term exposure to the space environment. Even before human spaceflight began, the potentially brief exposure of astronauts to the very intense random solar energetic particle (SEP) events was of great concern. A new challenge appears in deep space exploration from exposure to the low-intensity heavy-ion flux of the galactic cosmic rays (GCR) since the missions are of long duration and the accumulated exposures can be high. Since aluminum (traditionally used in spacecraft to avoid potential radiation risks) leads to prohibitively expensive mission launch costs, alternative materials need to be explored. An overview of the materials related issues and their impact on human space exploration will be given.

Author

Aluminum; Energetic Particles; Extraterrestrial Radiation; Galactic Cosmic Rays; Launch Costs; Space Exploration; Radiation Shielding

20010085368 Materials Sciences Corp., Fort Washington, PA USA

3D Woven Composites for New and Innovative Impact and Penetration Resistant Systems *Final Report, 15 Aug. 2000 - 31 May 2001*

Yen, Chian-Fong; Caiazzo, Anthony A.; Jul. 2001; 12p; In English; Original contains color plates

Contract(s)/Grant(s): DAAD19-00-C-0107

Report No.(s): AD-A392639; MSC-TPR-1015/CD01; ARO-41457.1-EG-STL; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of the Phase I study is to develop innovative high performance composites with superior ballistic damage tolerance capability suitable for armors and structures. Development of 3D triaxial weave composites, composite panels fabrication and testing have been completed. Good correlation of numerical simulation results with experimental data for ballistic velocity limits (V50) of plain weave and orthogonal weave panels has been demonstrated.

DTIC

Composite Structures; Damage; Penetration; Three Dimensional Composites; Fabrication

20010086190 Los Alamos National Lab., NM USA

Modeling and Testing of the Interfacial Stress State of a Tungsten-Clad Composite Using Push-Out Testing

Rutherford, R. W.; Johnson, W. R.; Jayaraman, N.; Maloy, S. A.; Homer, M. H.; Nov. 29, 2000; 14p; In English

Report No.(s): DE2001-768790; No Copyright; Avail: Department of Energy Information Bridge

To Study the properties of a tungsten-clad diffusion bonded interface push-out tests were performed. This method involves pushing out a tungsten rod while measuring the applied load and relative displacement of the tungsten and cladding. Specimens were tungsten in either wrought, annealed, or single crystal form with a 316L stainless steel clad. In the analysis of stress state and its dependence on failure mode for push-out testing, two important parameters are examined: specimen thickness, and support hole size. The measured push-out loads coupled with the finite element modeling were used to yield information about the tungsten-clad bond strength. There is currently no information available on the interface properties of the composite materials under investigation. Therefore, a qualitative/quantitative means of measuring interface strength utilizing push-out testing supported by Finite Element Modeling (FEM) was developed.

NTIS

Stress Analysis; Tungsten; Cladding; Composite Materials

20010089227 NASA Goddard Space Flight Center, Greenbelt, MD USA

Geometrically Nonlinear Finite Element Analysis of a Composite Space Reflector

Lee, Kee-Joo, Maryland Univ., USA; Leet, Sung W., Maryland Univ., USA; Clark, Greg, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Lightweight aerospace structures, such as low areal density composite space reflectors, are highly flexible and may undergo large deflection under applied loading, especially during the launch phase. Accordingly, geometrically nonlinear analysis that takes into account the effect of finite rotation may be needed to determine the deformed shape for a clearance check and the stress and strain state to ensure structural integrity. In this study, deformation of the space reflector is determined under static conditions using a geometrically nonlinear solid shell finite element model. For the solid shell element formulation, the kinematics of deformation is described by six variables that are purely vector components. Because rotational angles are not used, this approach is free of the limitations of small angle increments. This also allows easy connections between substructures and large load increments with respect to the conventional shell formulation using rotational parameters. Geometrically nonlinear analyses were carried out for three cases of static point loads applied at selected points. A chart shows results for a case when the load is applied at the center point of the reflector dish. The computed results capture the nonlinear behavior of the composite reflector as the applied load increases. Also, they are in good agreement with the data obtained by experiments.

Author

Large Space Structures; Elastic Deformation; Nonlinear Systems; Computerized Simulation

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also 34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics.

20010084279 Argonne National Lab., IL USA

Studies of Cosolvent Systems in Supercritical Ethane Using Solvated Electrons

Dimitrijevic, N. M.; Bartels, D. M.; Jonah, C. D.; Takahashi, K.; Nov. 2000; 12p; In English

Report No.(s): DE2001-768620; ANL/CHM/CP-103389; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper, pulse-radiolytic studies of the methanol-ethane cosolvent system are carried out. Our results show that at temperatures below approximately 110 degrees C, there are high local concentrations of alcohols (clusters) that are capable of solvating an electron, suggesting a size of approximately 4-5 methanol molecules at approximately 0.15 mole fraction alcohol. Reactions have been carried out between these solvated electrons and silver ions that are (presumably) dissolved in other small clusters of alcohols. These results show that the reaction between species in two different clusters is approximately 2 orders of magnitude slower than diffusion-controlled reactions.

NTIS

Electrons; Ethane; Solvation; Diffusion; Methyl Alcohol; Supercritical Fluids

20010084300 Sandia National Labs., Albuquerque, NM USA

Singular Perturbation Analysis of the Burning-Rate Eigenvalue for a Two-Temperature Model of Deflagrations in Confined Porous Energetic Materials

Margolis, S. B.; Baer, M. R.; Nov. 2000; 56p; In English

Report No.(s): DE2001-768286; SAND2000-8868; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Deflagrations in porous energetic materials are characterized by regions of two-phase flow, where, for sufficiently large flow velocities, temperature-nonequilibrium effects can significantly affect the overall burning rate. In the present work, we analyze a two-temperature model of deflagrations in confined porous propellants that exhibit a bubbling melt layer at their surfaces.

NTIS

Burning Rate; Deflagration; Eigenvalues; Perturbation; Porous Materials

20010084460 Pennsylvania State Univ., Dept. of Mechanical Engineering, University Park, PA USA

Liquid-Propellant Droplet Combustion and Cluster-Behavior at Supercritical Conditions *Final Report*

Yang, Yigor; May 2001; 214p; In English

Contract(s)/Grant(s): F49620-98-1-0034

Report No.(s): AD-A392689; AFRL-SR-BL-TR-01-0422; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

A systematic investigation of supercritical droplet vaporization and cluster behavior has been conducted based on the complete conservation equations in both the gas and liquid phases. The research work addresses a variety of fundamental issues related to droplet vaporization and dynamics at realistic conditions typical of liquid-propellant rocket combustion devices. A unified treatment of real-fluid thermodynamics has been developed based on fundamental theories. Special attention was given to the thermodynamic non-ideality and transport anomaly in the transcritical regime. A series of calculations has been performed to examine the cluster behavior of liquid oxygen (LOX) droplets in both sub- and super-critical hydrogen environments. Results show that pressure has strong effect on droplet interactions, while the temperature effect is relatively minor at high pressures. The hydrogen density plays a decisive role in determining droplet interactions through its influence on the temperature and mass fraction gradients at the LOX droplet surface. The characteristics of LOX droplet vaporization in forced-convective environments has also been studied. A dimensionless parameter $We/Oh^{1/2}$, which represents the ratio of aerodynamic and viscous forces, is found to be the major factor determining the droplet deformation under supercritical conditions. Results of droplet lifetime are well correlated as a function of the initial droplet Reynolds number and pressure. Finally, the interactions between two droplets moving in tandem in supercritical convective environments were investigated in detail.

DTIC

Liquid Propellant Rocket Engines; Supercritical Flow; Liquid Oxygen; Conservation Equations; Propellant Combustion; Liquid Rocket Propellants

20010084628 NASA Ames Research Center, Moffett Field, CA USA

Extraterrestrial Organic Chemistry: From the Interstellar Medium to the Origins of Life

Pohorille, Andrew, NASA Ames Research Center, USA; [2000]; 1p; In English; 33rd COSPAR Scientific Assembly, 17 Jun. - 25 Jul. 2000, Warsaw, Poland; Sponsored by Committee on Space Research

Contract(s)/Grant(s): RTOP 344-38-22-06; No Copyright; Avail: Issuing Activity; Abstract Only

Extraterrestrially delivered organics in the origin of cellular life. Various processes leading to the emergence of cellular life from organics delivered from space to earth or other planetary bodies in the solar system will be reviewed. The focus will be on: (1) self-assembly of amphiphilic material to vesicles and other structures, such as micelles and multilayers, and its role in creating environments suitable for chemical catalysis, (2) a possible role of extraterrestrial delivery of organics in the formation of the simplest bioenergetics (3) mechanisms leading from amino acids or their precursors to simple peptides and, subsequently, to the evolution of metabolism. These issues will be discussed from two opposite points of view: (1) Which molecules could have been particularly useful in the protobiological evolution; this may provide focus for searching for these molecules in interstellar media. (2) Assuming that a considerable part of the inventory of organic matter on the early earth was delivered extraterrestrially, what does relative abundance of different organics in space tell us about the scenario leading to the origin of life.

Author

Biological Evolution; Interstellar Matter; Organic Materials; Protobiology

20010084646 NASA Ames Research Center, Moffett Field, CA USA

Optical Spectroscopy of New Materials

White, Susan M., NASA Ames Research Center, USA; [1993]; 1p; In English

Contract(s)/Grant(s): RTOP 232-01-04; No Copyright; Avail: Issuing Activity; Abstract Only

Composites are currently used for a rapidly expanding number of applications including aircraft structures, rocket nozzles, thermal protection of spacecraft, high performance ablative surfaces, sports equipment including skis, tennis rackets and bicycles, lightweight automobile components, cutting tools, and optical-grade mirrors. Composites are formed from two or more insoluble materials to produce a material with superior properties to either component. Composites range from dispersion-hardened alloys to advanced fiber-reinforced composites. UV/VIS and FTIR spectroscopy currently is used to evaluate the bonding between the matrix and the fibers, monitor the curing process of a polymer, measure surface contamination, characterize the interphase material, monitor anion transport in polymer phases, characterize the void formation (voids must be minimized because, like cracks in a bulk material, they lead to failure), characterize the surface of the fiber component, and measure the overall optical properties for energy balances.

Author

Composite Materials; Optical Properties; Infrared Spectroscopy; Aircraft Structures; Optical Materials; Rocket Nozzles

20010085345 NASA Ames Research Center, Moffett Field, CA USA

On the reaction $\text{CH}_2\text{O} + \text{NH}_3$ Yields $\text{CH}_2\text{NH} + \text{H}_2\text{O}$

Walch, Stephen P., NASA Ames Research Center, USA; Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Ricca, Alessandra, NASA Ames Research Center, USA; Bakes, E. L. O., NASA Ames Research Center, USA; [2000]; 1p; In English

Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

We study the energetics of $\text{CH}_2\text{O} + \text{NH}_3$ Yields $\text{CH}_2\text{NH} + \text{H}_2\text{O}$ in the gas phase at the B3LYP and CCSD(T) levels. This reaction is shown to have a sizeable barrier. Ionization of NH_3 reduces the barrier to about 5 kcal/mol. We also show that in water, a proton catalyzed mechanism yields no barriers in excess of the reaction endothermicity. Since this reaction has been proposed as one of the steps in interstellar synthesis of glycine, the simplest amino acid, this work suggests that the formation of amino acids is occurring in and/or on interstellar water ice grains, and not in the gas phase.

Author

Vapor Phases; Chemical Reactions; Ammonia

20010085371 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA

Organoarsenic Compounds, 2, Separation and Stereochemical Determination of 5-Substituted 2-Phenyl-1,3,2-Dithiarsenanes Final Report, Jun. - Dec. 2000

Bossie, Paul C.; Hsu, Fu-Lian; Wagner, George W.; Rohrbaugh, Dennis K.; May 2001; 23p; In English

Contract(s)/Grant(s): PR-611101

Report No.(s): AD-A392741; ECBC-TR-170; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The cis- and trans-isomers of 5-substituted 2-phenyl-1,3,2-dithiarsenanes (compounds 5 and 6) are the adducts of the lewisite simulant, phenyl dichloroarsine (3), and the 2-substituted 1,3-propanedithiols (1 and 2). The isomers were separated by reverse-phase liquid chromatography and identified by photodiode-array/mass spectrometry. The stereochemistry of these adducts is assigned based on H1 NMR Nuclear Overhauser Effect difference measurements.

DTIC

Isomers; Overhauser Effect; Nuclear Magnetic Resonance

20010085391 Washington Univ., Dept. of Chemical Engineering, Seattle, WA USA

Temperature and Field Dependence of Protonated Water Cluster Emission from Field Adsorbed Water Layers on Platinum *Interim Report*

Rothfuss, Christopher J.; Medvedev, Valentin K.; Stuve, Eric M.; Jul. 31, 2001; 37p; In English

Contract(s)/Grant(s): N00014-97-1-0417

Report No.(s): AD-A392815; TR-14; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Water ion cluster formation in high electric fields was characterized on a Pt emitter tip over temperatures ranging from 170 to 300 K. Ion clusters emitted from the field-adsorbed water layer were mass resolved using a Wien filter. Two series of tests were conducted to characterize the ion cluster formation. In the first, tip temperature and water pressure were held constant while the applied field at the tip was ramped linearly with time. As the field was increased, water ion clusters $H^{+}(H_2O)_n$ were emitted, beginning with large n clusters (up to 7) and proceeding through each lower n cluster in turn. The ion emission onset field was found to depend on the value of n and is lower for larger n clusters. The onset of ionization for each cluster was observed to be relatively constant as a function of temperature, however, ion signal intensity was temperature dependent. For the second series of tests, tip temperature was cyclically ramped while the applied field was held constant. The cyclical ramping experiments provided Arrhenius graphs showing thermal deactivation energies for ion emission from the tip. The observed deactivation corresponds to thermal desorption of the nth solvating water molecule of the ion cluster, i.e., the energy associated with the solvation of the proton by the nth solvating water molecule. These energies were found to be 0.85 eV, 0.76 eV, and 0.55 eV for n = 3, 4, and 5, respectively.

DTIC

Temperature Dependence; Electric Fields; Ion Emission; Clusters; Ionization

20010085928 City Univ. of New York, Dept. of Chemistry, Brooklyn, NY USA

Ionic and Electronic Transport in Gels and Aerogels, 1 Oct. 2000 - 30 Jun. 2001

Ciszkowska, M.; Tomkiewicz, M.; Jul. 15, 2001; 38p; In English

Contract(s)/Grant(s): N00014-98-1-0244

Report No.(s): AD-A392450; TR-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Organic and inorganic gels, and gel-derivatives such as aerogels and xerogels, find numerous applications in areas such as batteries, fuel cells, photoelectrochemical solar cells, photocatalytic devices, supercapacitors, control-release drug delivery systems, separation techniques, and others. Modern microscopic and electrochemical techniques offer the possibility of understanding structural properties of these systems down to almost atomic level. Most of the applications involve solid-liquid interfaces that occupy a significant fraction of the volume of these materials. This review discusses transport in three heterogeneous systems with important applications: solutions of ionic polymers, polymeric gels and aerogels.

DTIC

Aerogels; Ions; Polymers; Transport Properties; Gels; Inorganic Materials

20010085933 City Univ. of New York, Dept. of Chemistry, Brooklyn, NY USA

Transport of Ions and Electrostatic Interactions in Thermoresponsive Poly (N-Isopropylacrylamide-co-Acrylic Acid) Hydrogels: Electroanalytical Studies, 1 Oct. 2000 - 30 Jun. 2001

Ma, C.; Zhang, W.; Ciszkowska, M.; Jul. 15, 2001; 33p; In English

Contract(s)/Grant(s): N00014-98-1-0244

Report No.(s): AD-A392494; Rept-10; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To study transport phenomena and electrostatic interactions in negatively charged poly(N-isopropylacrylamide-co-acrylic acid) hydrogels, NIPA-AA, electroanalytical experiments with two positively charged probes, ferrocenylmethyltrimethylammonium, $FcTMA^{+}$, and hexaammineruthenium(III), $Ru(NH_3)_6^{3+}$, cations were performed, and the results compared with those for an uncharged electroactive probe, 1,1'-ferrocenedimethanol, $Fc(MeOH)_2$. Steady-state voltammetry and chronoamperometry at platinum disk microelectrodes were used to determine diffusion coefficients of those probes. For temperatures below the volume phase transition of a gel, there are not significant

differences in the transport behavior of cationic and uncharged probes. After the volume phase transition occurs and the gel collapses, the diffusion coefficients of all probes decrease, the change in diffusion coefficient is more pronounced for cationic probes than for a neutral probe, and depends on the charge of the cationic probe. Changes in concentration of cationic species in collapsed NIPA-AA gels were detected as a result of the volume phase transition.

DTIC

Gels; Electrostatics; Transport Properties; Polymers; Electrochemistry; Diffusion Coefficient

20010085936 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA

Use of Quantum Mechanical Calculations to Investigate Small Silicon Carbide Clusters

Henry, Jean W.; Mar. 2001; 120p; In English

Report No.(s): AD-A392522; AFIT/GAP/ENP/01M-04; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Density Functional Theory (DFT) method was employed to model silicon carbide small clusters. Comparing the DFT calculation results with experimental results that observed by using photoelectron spectroscopy (PES), DFT predicts the same structures that experiment observed. For electron affinity, DFT results are in good agreement with experimental results, the root mean square negative offset 0.1 eV found using medium size of basis set (cc-pVDZ+) calculation. DFT results for vibrational frequencies are in good agreement with experiment results; the root mean square error is 72.5/cm wave number. 16 ground state structures of Si(sub m)C(sub n) (m is less than or = 4, n is less than or = 4) clusters were found using DFT:B3LYP/cc-pVDZ calculations, the properties of these structures were discussed. The calculation accuracy of electron affinity is affected by the properties of basis sets. Increasing basis set size improves the energy results of singlet and triplet state more than the energy result of doublet state; adding diffuse functions into basis sets dramatically improves the energy result of doublet state. Computational time scaling of DFT computations in SiC system was conducted. A brief an accuracy assessment study of AM1 semi-empirical method for Si(sub m)C(sub n) clusters was also performed.

DTIC

Quantum Mechanics; Silicon Carbides; Quantum Statistics; Atomic Energy Levels; Mean Square Values

20010086231 New Century Pharmaceuticals, Inc., Huntsville, AL USA

Electrophoretic Focusing *Monthly Report, Period ending 31 Jul. 2001*

Snyder, Robert S., New Century Pharmaceuticals, Inc., USA; August 2001; 3p; In English

Contract(s)/Grant(s): NAS8-99069

Report No.(s): MR-13; No Copyright; Avail: Issuing Activity; Abstract Only

Electrophoretic focusing is a new method of continuous flow electrophoresis that introduces precision flow control to achieve high resolution separations. The electric field is applied perpendicular to an incoming sample lamina and buffer but also perpendicular to the broad faces of the thin rectangular chamber. A uniform fluid cross-flow then enters and exits the separation chamber through the same broad faces which are porous. A balance is achieved by adjusting either the electric field or the cross-flow so the desired sample fraction with its specific migration velocity encounters an opposing flow of the same velocity. Applying an electric field transverse to the incoming sample lamina and opposing this field with a carefully configured buffer flow, a sample constituent can be selected and focused into a narrow stream for subsequent analysis. Monotonically changing either electric field or buffer cross-flow will yield a scan of all constituents of the sample. Stopping the scan increases the collection time for minor constituents to improve their analysis. Using the high voltage gradients and/or cross-flow to rapidly deflect extraneous sample through the porous screens and into either of the side (purge) chambers, the selected sample is focused in the center plane of the separation chamber and collected without contact or interaction with the separation chamber walls. Results will be presented on the separation of a range of materials including dyes, proteins, and monodisperse polystyrene latexes. Sources of sample dispersion inherent in other electrokinetic techniques will be shown to be negligible for a variety of sample concentrations, buffer properties and operating conditions.

Author

Cross Flow; Electrophoresis; Electric Fields; Flow Stability; Fluid Dynamics

20010086972 Centro Siciliano per le Ricerche Atmosferiche e di Fisica dell'Ambiente, Messina, Italy

The Optical Properties of Aerosols *Final Report*

Borghese, F.; May 2001; 4p; In English

Contract(s)/Grant(s): N68171-98-M-5531

Report No.(s): AD-A392728; R/D-8560-EN-01; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

The topics investigated under the present Contract can be summarized as follows: 1. Analysis by nondestructive means of the degree of cleanliness of a metallic or dielectric surface. 2. Determination of the contribution to the greenhouse effect from the

ice crystal that are present in the high atmosphere (namely in cirrus clouds). 3. Discrimination of the shape and backscattering properties of atmospheric ice crystals in the millimeter wave range. The results of the above mentioned investigations were expounded in several papers that were already published or are at present in the press. The list of these papers is reported at the end of the present report.

DTIC

Aerosols; Optical Properties

20010087433 Argonne National Lab., IL USA

Quantitative Analysis of Hydrogen Gas Formed by Aqueous Corrosion of Metallic Uranium

Fonnesbeck, J. E.; September 2000; 30p; In English

Report No.(s): PB2001-106457; ANL-00/19; No Copyright; Avail: National Technical Information Service (NTIS)

Three unirradiated EBR-11 blanket fbel samples containing depleted uranium metal were corrosion tested in simulated J-13 well water at 90 C. The purpose was to study the products of the aqueous corrosion of U metal i.e UOZ, UO₂, UH approximately, and H₂. The corrosion products were weighed for mass balance and analyzed by x-ray powder diffraction. The data showed that UOZ powder, as well as higher oxides i.e. UOZ⁺, had formed. However, no UHJ was detected. The corrosion rate of uranium metal in water at 900 C was inferred by collecting and quantitatively measuring the hydrogen gas evolved.

NTIS

Hydrogen; Quantitative Analysis; Uranium; Corrosion Prevention; Aqueous Solutions

20010087786 Quebec Univ., Anti-icing Material International Lab., Chicoutimi, Quebec Canada

Anti-Icing Endurance Time Tests of Two Certified SAE Type I Aircraft Deicing Fluids Final Report

Bouchard, Kathy; Laforte, Jean-Louis; Beisswenger, Arlene; Apr. 2001; 68p; In English

Report No.(s): AD-A392707; DOT/FAA/AR-01/13; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report presents the results of Anti-Icing Endurance Time (AET) tests performed with unsheared samples of two certified SAE Type I aircraft deicing fluids from September 5 to October 15, 1999, at the Anti-Icing Materials International Laboratory (AMIL). Over 100 tests, including 25 calibration and 50 fluid tests, were conducted at various temperatures and icing intensities, under the six environmental conditions addressed in the holdover time (HOT) guidelines published by the SAE as part of the ARP 4737: frost (3), freezing fog (6), snow (6), freezing drizzle (4), light freezing rain (4) and rain on a cold-soaked wing (2). The results obtained demonstrate the feasibility of performing the six AET testing procedures within the prescribed accuracy and repeatability. Indeed, environmental parameters in AET calibration and fluid tests were kept within the target values with variations within the allowable drifts. Moreover, AET results showed an expected inverse relationship between endurance times and precipitation rate; the shortest and longest failure times being obtained respectively under the highest and lowest icing rates. The AET test results were also compared and discussed with HOT data obtained in a parallel test set performed in July 1999 by APS Aviation (APS) at the Canadian National Research Council (NRC) facility. These tests include freezing fog, snow, freezing drizzle, and light freezing rain tests at -10 C, and rain on a cold-soaked wing at +1 C. However, their testing methods are somewhat different. AMIL failure times are systematically found to be 1 to 2 minutes shorter than APS's measured values for mean variation up to 30%, depending on test conditions. These lower failure times can be partially attributed to differences in procedures used during the test performance.

DTIC

Ice Formation; Ice Prevention; Deicing; Endurance; Environment Management

20010088785 Institute of Space Medico-Engineering, Beijing, China

A Study on Steam Generator in Solid Amine CO₂ Purification System

Zhou, Kang-Han, Institute of Space Medico-Engineering, China; Liu, Xiang-Yang, Institute of Space Medico-Engineering, China; Lu, Xi-Yu, Institute of Space Medico-Engineering, China; Ai, Shang-Kun, Institute of Space Medico-Engineering, China; Li, Shun-Lu, Institute of Space Medico-Engineering, China; Huang, Yan, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 132-136; In Chinese; Copyright; Avail: Issuing Activity

Objective: to solve the key problems of power matching between process of CO₂ steam desorption and process of steam generation, as well as water/vapor separation. Method: Solid amine desorption process was studied by thermodynamic analysis and experiments. The distribution rule of desorption energy was found out and then the power consumption of steam generator was decided. Ceramic insert was designed to separate water and vapor making use of surface tension. Finally, the steam generator was designed on system requirements. Result: Experiments proved that the steam generator can satisfy the demand of the system

as well as successfully separate water and vapor, in addition, the selected power is suitable. Conclusion: The design on steam generator was right and practicable.

Author

Water Vapor; Thermodynamics; Steam; Carbon Dioxide; Solid Cryogenics; Solidified Gases; Amines

20010089241 National Renewable Energy Lab., Golden, CO USA

Scanning Tunneling Microscopy Study of As/Ge(mnn) and P/Ge(mnn) Surfaces

McMahon, W. E.; Olson, J. M.; Nov. 2000; 14p; In English; 12th American Conference on Crystal Growth and Epitaxy, 14-18 Aug. 2000, Vail, CO, USA

Report No.(s): DE2001-772430; NREL/CP-520-28911; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Ge(mnn) surfaces between (100) and (111) were annealed under either arsine or phosphine in a metal-organic chemical vapor deposition chamber, then imaged with a scanning tunneling microscope. In general, arsine-exposed Ge surfaces are faceted, while phosphine-exposed surfaces remain flat. For the arsine-exposed Ge surfaces, four stable faceting directions have been identified: (100), (11,3,3), (955), and (111).

NTIS

Arsenic Compounds; Electron Tunneling; Scanning Tunneling Microscopy; Phosphines

26

METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20010083768 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan

Simple Model for Selective Helium Pumping of Nickel: Temperature Dependence of Helium Retention

Hino, Tomoaki, Hokkaido Univ., Japan; Yanagihara, Hideto, Hokkaido Univ., Japan; Yamashina, Toshiro, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; February 1994; ISSN 0385-602X, No. 168, pp. 49-52; In English; Copyright Waived; Avail: Issuing Activity

A simple model for He selective pumping of Ni, which may be applied for ash removal in a fusion reactor, is proposed to explain the temperature dependence of He retention. The He retention is determined by the balance of trapped He ions in the surface, the diffusion from the surface to bulk and the loss from the bulk due to the Ni self diffusion. In this model, explained is the appearance of maximum He retention in the domain of the irradiation temperature.

Author

Helium; Nickel; Models; Ion Pumps

20010086245 Alabama Univ., Birmingham, AL USA

Production and Machining of Thin Wall Gray and Ductile Cast Iron Final Report, 1 Jul. 1997 - 31 May 2000

Li, H.; Griffin, R.; Bates, C. E.; Eleftheriou, E.; Nov. 2000; 78p; In English; In cooperation with the American Foundry Society Report No.(s): DE2001-769201; DOE-ID-13555; No Copyright; Avail: Department of Energy Information Bridge

The University of Alabama at Birmingham, in cooperation with the American Foundry Society, companies across North America, with support from the US Department of Energy, is conducting a project to develop an understanding of the factors that control the machinability of cast gray and ductile iron. Differences of as much as 500% have been found in machinability have been observed at the same strength. The most machinable irons were those with a high cell counts and few carbonitride inclusions. Additions of tin and copper can be added to both gray and ductile iron to stabilize the pearlite, but excessive additions (above those required to produce the desired pearlite content) degrade the machinability.

NTIS

Machining; Thin Walls; Ductility; Iron; Cast Alloys

20010086960 Naval Academy, Annapolis, MD USA

Optimizing the Strength and SCC Resistance of Aluminum Alloys used for Refurbishing Aging Aircraft

Ferrer, Charles P.; May 07, 2001; 113p; In English

Report No.(s): AD-A392453; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The focus of this report is on the mechanical end corrosion properties of high-strength aluminum alloys. Aluminum alloy 7075, a common material in the aerospace industry, is susceptible to stress-corrosion cracking (SCC) in the T6, or peak-aged

temper. The susceptibility of this temper to SCC is alleviated through the use of the T73, or overaged temper. This temper exhibits significantly better SCC resistance, but at a 10-15% strength loss compared to the T6 temper. Cina and Ranish patented a new heat treatment known as retrogression and reaging (RRA) in 1974. Experimental test results indicate that the RRA heat treatment reduces the traditional trade-off between T6 strength and T73 SCC resistance. However, the short time heat treatment limits the applicability of RRA to thin sections of material. The primary goal of this research was to determine if lower retrogression temperatures could be used in the RRA process to extend the applicability of this heat treatment to thick sections. Tensile, fatigue, fracture toughness, and hardness tests were conducted to characterize the mechanical properties of the T6, T73, and various RRA tempers. Alternate immersion and double-cantilever beam tests were conducted to evaluate the corrosion properties of the different tempers.

DTIC

High Strength Alloys; Fracture Strength; Aluminum Alloys; Stress Corrosion Cracking; Fracture Mechanics

20010086962 European Research Office (US Army), Army Research Lab., London, UK

Effects of Impact Velocity and Stress Concentrators in Titanium on Failure by Adiabatic Shearing *Interim Report, 18 Nov. 2000 - 17 Feb. 2001*

Klepaczko, J. R., European Research Office (US Army), UK; Feb. 2001; 3p; In English

Contract(s)/Grant(s): N68171-00-M-5984

Report No.(s): AD-A392570; R/D-9022-AN-01; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

This Interim Report covers the contract period from Nov. 18/2000 to Feb. 17/2001 (second period of three months). During this period a series of shear tests on fast servo-hydraulic testing frame with three specimen geometries have been completed. That is the following geometries of notches were applied: (1) U-geometry, (2) V-geometry, and (3) I-geometry. The standard geometry with a square notch was tested during the first interim period. The specimen geometries are specially design to increase the stress concentration before triggering an adiabatic shear band. The material tested was Ti-6Al-4V, delivered by the ARL-APG-AMSRL. This series of tests was limited to relatively low nominal strain rates, from $10E-3$ 1/s to $10E+3$ 1/s. Analysis of the oscillograms obtained with those tests are almost finished. The experimental setup for the direct impact loading has been improved and experiments are started and are continued. The range of the nominal strain rates covered by the direct impact technique is from $10E+3$ 1/s to $10E+5$ 1/s.

DTIC

Impact Velocity; Stress Concentration; Titanium; Shearing; Shear Properties; Adiabatic Conditions

20010087127 Defence Science and Technology Organisation, Airframes and Engines Div., Fishermans Bend, Australia

The Effect of Peening on the Fatigue Life of 7050 Aluminium Alloy

Sharp, P. K., Defence Science and Technology Organisation, Australia; Clark, G., Defence Science and Technology Organisation, Australia; March 2001; 70p; In English; Original contains color illustrations

Report No.(s): DSTO-RR-0208; DODA-AR-011-795; Copyright; Avail: Issuing Activity

Many changes in the design and manufacture of high-performance military aircraft - for example, the use of highly optimized design and the use of higher-strength material - have led to an increased sensitivity of airframe fatigue life to surface features such as corrosion or mechanical damage. The peening applied to the F/A-18 represents a significant departure from traditional manufacture, and it is therefore important that the RAAF (Royal Australian Air Force) and AMRL (Aeronautical and Maritime Research Laboratory) have a thorough understanding of the peening process, the surface conditions produced, and their effect on structural integrity. This report discusses the fatigue crack growth research at AMRL, and elsewhere, relating to peening of aluminium alloys, and summarizes the improvements in peening which have arisen from this research. The overall aim of the peening research and development discussed was to establish a Life-Improvement-Factor (LIF) for the peening used on the F/A-18, as well as any future peening required by modifications. It also attempted to provide a means of measuring peening quality, to allow the full exploitation of peening to improve fatigue life. It also highlights areas where further research could be beneficial in relation to peening and the structural integrity of the F/A-18 aircraft. The report highlights the practical problems of introducing changes to fatigue critical surfaces, with particular reference to the RAAF and CF (Canadian Forces) fleets.

Author

Peening; Airframes; Aluminum Alloys; Fatigue Life; Crack Propagation; Structural Analysis; Metal Fatigue; Surface Finishing

20010088840 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Numerical Prediction of Fragmentation On-Set, Part 1, Steel, Tantalum and Copper Fragments *Final Report*

Verolme, K., Prins Maurits Lab. TNO, Netherlands; November 2000; 18p; In English; Original contains color illustrations

Contract(s)/Grant(s): A99/KLu/4NH; TNO Proj. 014.11959

Report No.(s): TD2000-0057; PML-2000-A55; Copyright; Avail: Issuing Activity

When studying high velocity interaction of fragments and thin targets, like for instance in lethality/vulnerability modelling of flying platforms and for ballistic missile defense, prediction of onset of break up of fragments is crucial. Should a fragment break up into smaller fragments spread out into a cone, the lethal area may be increased (also off the line of fire) or even decreased (when the residual fragments have become so small that hardly any effects can be expected). The work described here presents a series of numerical simulations, using the AUTODYN hydrocode, of different metallic projectiles impacting transparent targets. The configurations have been studied carefully experimentally. They consist of high velocity impact of metallic spheres on transparent targets. The transparent targets were chosen such that X-rays of the debris cloud produced by the impact would consist only of the deformed and/or fragmented projectile. By comparing the experimental results with the simulation predictions, the suitability of the numerical methodology used could be determined. A generic methodology, not including any fuzzy factors, has been developed which predicts the onset of fragmentation and the extent of the debris cloud rather well, depending on the accuracy and reliability of the input material models of both projectile and target.

Author

Fragmentation; Predictions; Impact Tests; Ammunition; Hypervelocity Projectiles; Terminal Ballistics; Fragments; Debris

27

NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

20010084463 Naval Academy, Annapolis, MD USA

Why Conductivity Decreases with Pressure in Ion-Doped Polymers, 1 Jun 2000-31 May 2001

Bendler, J. T.; Fontanella, J. J.; Shlesinger, M. F.; Jul. 01, 2001; 10p; In English

Contract(s)/Grant(s): N0001401AF00002; Proj-1PR02263-00

Report No.(s): AD-A392699; TR-27; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The relaxation time scale in glassy materials is derived within a model of anomalous defect diffusion. The effect of the defects on ion-doped polymeric glasses is to produce a stretched exponential waiting time distribution for ion jumps. The characteristic time scale for ion jumps is connected to the temperature and pressure dependent concentration of mobile defects. The resultant expression for ionic conductivity is compared with experimental results for the polymer electrolytes poly(ethylene glycol) (PEQ) and poly(propylene glycol) (PPG) containing LiCF₃SO₃.

DTIC

Doped Crystals; Ions; Polymers; Electrical Resistivity; Defects

20010084768 NASA Ames Research Center, Moffett Field, CA USA

Aerogels in Space-Based Applications

White, Susan M., NASA Ames Research Center, USA; [1994]; 1p; In English; 4th International Symposium on Aerogels, 18-21 Sep. 1994, Berkeley, CA, USA

Contract(s)/Grant(s): RTOP 232-01-04; No Copyright; Avail: Issuing Activity; Abstract Only

Aerogel materials have two major space applications. Aerogels have already been used in Shuttle-based experiments to capture micrometeorites for earth-based investigation of the captured particles. To exploit the well-known low thermal conductivity of these materials, the use of aerogels for thermal insulation of spacecraft is under investigation. This paper will draw on published information about aerogels and other materials, and will include only noncritical technology. No discussion will be included of specific chemical processing techniques or of advanced, technologically critical concepts.

Author

Micrometeorites; Thermal Insulation; Aerogels; Low Conductivity

20010085384 Pittsburgh Univ., Pittsburgh, PA USA

Designing Polymer Blends Through Modeling and Simulation *Final Report, 1 Mar. 1998 - 25 Feb. 2001*

Balazs, Anna C.; Jasnow, David; Jun. 29, 2001; 5p; In English

Contract(s)/Grant(s): DAAG55-98-1-0115

Report No.(s): AD-A392749; ARO-37574.7-CH; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

Using theoretical models and computer simulations, we determined guidelines for promoting the uniform dispersion (exfoliation) of clay sheets in polymer melts. In addition, we determined how the coupling between phase separation and wetting interactions in polymeric composites effects the structural evolution and phase behavior of the material. We also developed a mean field theory for mixtures of soft, flexible chains and hard spheres. Applied to diblock/nanoparticle mixtures, and theory predicts new ordered phase, where particles and diblocks self-assemble into spatially periodic structures. The method can be applied to other copolymer/particle mixtures and used to design novel composite architectures.

DTIC

Mathematical Models; Computerized Simulation; Polymer Blends

20010085937 Massachusetts Univ., Dept. of Polymer Science and Engineering, Amherst, MA USA

Systematic Control of Morphology and Properties Through Graft Copolymer Molecular Architecture *Final Report, 1 Mar. 1998 - 28 Feb. 2001*

Gido, Samuel P.; Feb. 2001; 14p; In English

Contract(s)/Grant(s): DAAG55-98-1-0118

Report No.(s): AD-A392526; ARO-37688.1-CH; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project is to understand how variations in the molecular architecture of block and graft copolymers can be manipulated in order to develop materials with exceptional mechanical, transport, and optical properties, tailored for Army applications. We systematically explored the effect of these different molecular architectures on the nanometer scale, morphological self assembly of the materials. Our research has demonstrated, that a large number of the possible molecular variations can be represented by a single molecular asymmetry parameter, which we have used to develop an understanding of morphology in these materials. We have demonstrated that long range order of microphase separated morphology is reduced as the number of branch points increases in graft copolymers. Additionally, excellent elastomeric mechanical properties are obtained in graft copolymers with tetrafunctional branch points and seven or more branch points per molecule.

DTIC

Molecules; Polymerization; Mechanical Properties; Block Copolymers; Grafting

20010085948 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Cluster Expansions for Abstract Polymer Systems

Miracle-Sole, S.; May 2001; 12p

Report No.(s): PB2001-106884; IHES/P/01/21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

No abstract available.

NTIS

Polymers; Clusters

20010086585 Oak Ridge National Lab., TN USA

Formation and Erosion of WC Under W(+) Irradiation of Graphite

Roth, J.; Toussaint, U. V.; Schmid, K.; Luthin, J.; Eckstein, W.; 2001; 10p; In English

Report No.(s): PB2001-106595; No Copyright; Avail: National Technical Information Service (NTIS)

The bombardment of C with 100 keV and 1 MeV W at normal incidence is studied as a function of the incident W fluence experimentally and by computer simulation with the program TRIDYN. Calculated oscillations in the amount of retained W and in the target weight change are confirmed experimentally for 100 keV at room temperature. XPS investigations show W₂C formation during ion implantation already at room temperature. RBS depth profiles for 1 MeV bombardment show W mobility and surface segregation even at liquid nitrogen (LN(sub 2)) temperatures. At elevated temperatures W clusters to form nano-particles at the surface and the oscillations in the retained amount of W disappear.

NTIS

Graphite; Carbon; Tungsten; Erosion; Liquid Nitrogen; Computerized Simulation

20010088232 Argonne National Lab., IL USA

Interaction Phenomena at Reactive Metal/Ceramic Interfaces

McDeavitt, S. M.; Billings, G. W.; Indacochea, J. E.; 2001; 14p; In English

Report No.(s): DE2001-768573; ANL/CMT/CP-101297; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this study was to understand the interface chemical reactions between stable ceramics and reactive liquid metals, and developing microstructure. Experiments were conducted at elevated temperatures where small metal samples of Zr and Zr-alloy were placed on top of selected oxide and non-oxide ceramic substrates (Y2O3, ZrN, ZrC, and HfC). The sample stage was heated in high-purity argon to about 20000 C, held in most cases for five minutes at the peak temperature, and then cooled to room temperature at -20 c/min. An external video camera was used to monitor the in-situ wetting and interface reactions. Post-test examinations of the systems were conducted by scanning electron microscopy and energy dispersive spectroscopy. It was determined that the Zr and the Zr-alloy are very active in the wetting of stable ceramics at elevated temperatures. In addition, in some systems, such as Zr/ZrN, a reactive transition phase formed between the ceramic and the metal. In other systems, such as Zr/Y2O3, Zr/ZrC and Zr/HfC, no reaction products formed, but a continuous and strong joint developed under these circumstances also. packages, glass-to-metal seals, and liquid metal process systems.

NTIS

Reaction Products; Chemical Reactions; Ceramics; Liquid Metals; Reactivity; Microstructure

20010088359 Institute of Space Medico-Engineering, Beijing, China

A Study on Physical Characteristics of Porous Plates for Water Sublimator

Wu, Zhi-Qiang, Institute of Space Medico-Engineering, China; Han, Li-Jun, Institute of Space Medico-Engineering, China; Shen, Li-Ping, Institute of Space Medico-Engineering, China; Yuan, Xiu-Gan, Institute of Space Medico-Engineering, China; Li, Tan-Qiu, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 127-131; In Chinese; Copyright; Avail: Issuing Activity

Objective: to Investigate the development method of porous plate, the key part of water sublimator, and its main physical characteristics. Method: Technical parameters of porous plates used in water sublimator were analyzed. On the basis of this, porous plates made of different materials were developed by making use of sintered powder technology. A tester for testing the physical characteristics of porous plate was designed. All around physical characteristic tests for porous plates were conducted. Result: Main factors affecting performance of porous plates were tested. These provided basis for performance test of sublimator, established porous plate criterion and optimized porous plate. Conclusion: Porous plates developed by making use of sintered powder technology could meet requirements of performance of water sublimator.

Author

Water; Powder (Particles); Performance Tests; Aerospace Medicine

20010088842 Santa Clara Univ., School of Engineering, CA USA

SHARP Demonstration Flight: Video Broadcast System for Research in Intelligent Flight Characterization and Control Final Report, 1 Aug. 2000 - 30 Sep. 2001

Kitts, Christopher, Santa Clara Univ., USA; [2001]; 3p; In English

Contract(s)/Grant(s): NCC2-1195; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The NASA Ames Research Center (Thermal Protection Materials and Systems Branch) is investigating new ceramic materials for the thermal protection of atmospheric entry vehicles. An incremental approach to proving the capabilities of these materials calls for a lifting entry flight test of a sharp leading edge component on the proposed SHARP (Slender Hypervelocity Aerothermodynamic Research Probe) vehicle. This flight test will establish the aerothermal performance constraint under real lifting entry conditions. NASA Ames has been developing the SHARP test flight with SSDL (responsible for the SHARP S I vehicle avionics), Montana State University (responsible for the SHARP S I vehicle airframe), the Wickman Spacecraft and Propulsion Company (responsible for the sounding rocket and launch operations), and with the SCU Intelligent Robotics Program. The SCU team was added well after the rest of the development team had formed. The SCU role was to assist with the development of a real-time video broadcast system which would relay onboard flight video to a communication groundstation. The SCU team would also assist with general vehicle preparation as well as flight operations. At the time of the submission of the original SCU proposal, a test flight in Wyoming was originally targeted for September 2000. This date was moved several times into the Fall of 2000. It was then postponed until the Spring of 2001, and later pushed into late Summer 2001. to date, the flight has still not taken place. These project delays resulted in SCU requesting several no-cost extensions to the project. Based on the most recent conversations with the project technical lead, Paul Kolodziej, the current plan is for the overall SHARP team to assemble what

exists of the vehicle, to document the system, and to 'mothball' the vehicle in anticipation of future flight and funding opportunities.

Derived from text

Aerothermodynamics; Ceramics; Characterization; Thermal Protection

20010089133 National Inst. of Standards and Technology, Gaithersburg, MD USA

Ultrasonic Extraction/Anodic Stripping Voltammetry for Determining Lead in Household Paint: A Laboratory Evaluation

Rossiter, W. J.; Vangel, M. G.; McKnight, M. E.; Signor, A.; Byrd, W. E.; Apr. 2001; 72p; In English

Report No.(s): PB2001-105379; NISTIR-6571; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

A laboratory study was conducted to evaluate the reliability of commercial, field-portable ultrasonic extraction-anodic stripping voltammetry (UE/ASV) for determining the lead levels of laboratory-prepared paint films when tests were performed by certified lead inspectors trained to conduct UE/ASV testing.

NTIS

Anodic Stripping; Extraction; Paints; Lead (Metal)

20010089255 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Modeling and Analysis of Wrinkled Membranes: An Overview

Yang, B., University of Southern California, USA; Ding, H., University of Southern California, USA; Lou, M., Jet Propulsion Lab., California Inst. of Tech., USA; Fang, H., Jet Propulsion Lab., California Inst. of Tech., USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Thin-film membranes are basic elements of a variety of space inflatable/deployable structures. Wrinkling degrades the performance and reliability of these membrane structures, and hence has been a topic of continued interest. Wrinkling analysis of membranes for general geometry and arbitrary boundary conditions is quite challenging. The objective of this presentation is two-fold. Firstly, the existing models of wrinkled membranes and related numerical solution methods are reviewed. The important issues to be discussed are the capability of a membrane model to characterize taut, wrinkled and slack states of membranes in a consistent and physically reasonable manner; the ability of a wrinkling analysis method to predict the formation and growth of wrinkled regions, and to determine out-of-plane deformation and wrinkled waves; the convergence of a numerical solution method for wrinkling analysis; and the compatibility of a wrinkling analysis with general-purpose finite element codes. According to this review, several opening issues in modeling and analysis of wrinkled membranes that are to be addressed in future research are summarized. The second objective of this presentation is to discuss a newly developed membrane model of two viable parameters (2-VP model) and associated parametric finite element method (PFEM) for wrinkling analysis are introduced. The innovations and advantages of the proposed membrane model and PFEM-based wrinkling analysis are: (1) Via a unified stress-strain relation; the 2-VP model treat the taut, wrinkled, and slack states of membranes consistently; (2) The PFEM-based wrinkling analysis has guaranteed convergence; (3) The 2-VP model along with PFEM is capable of predicting membrane out-of-plane deformations; and (4) The PFEM can be integrated into any existing finite element code. Preliminary numerical examples are also included in this presentation to demonstrate the 2-VP model and PFEM-based wrinkling analysis approach.

Author

Membrane Structures; Wrinkling; Large Space Structures; Computerized Simulation

20010089347 Universal Energy Systems, Inc., Dayton, OH USA

Development of Advanced Coatings as Palliatives for Avoidance of Fretting and Galling in Titanium Alloy Final Report, 27 Apr. 2000 - 26 Jan. 2001

Rai, Amarendra K.; Ahmed, J.; Jan. 26, 2001; 50p; In English; Prepared in cooperation with Research Applications Inc, San Diego, CA. AF00-167.

Contract(s)/Grant(s): F33615-00-C-5506

Report No.(s): AD-A387446; UES-P701; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report has been developed under a SBIR contract for Topic AF00-167. The titanium (Ti) turbine engine components such as blades and discs are susceptible to fretting related damage and therefore is a major concern for US Air Force. The purpose of the Phase 1 work was to develop advanced multifunctional coatings as palliatives for mitigating the fretting related damage in titanium alloy and to rationalize the fretting damage with finite element analysis. Vacuum filtered arc and magnetron sputtering techniques were used to develop various coatings. The composition and structure of the developed coatings were thoroughly characterized. Fretting wear and friction behavior of the coatings deposited on Ti alloy was evaluated in a reciprocating pin-on-flat

configuration with small displacement amplitude. Most of the coatings showed considerable promise in mitigating fretting wear. Limited fretting fatigue tests were also conducted on coated specimens. So far no improvement in the fatigue life of coated specimens was found. Based on finite element analysis an expression was developed which may help in selecting suitable coatings for enhanced fatigue life.

DTIC

Fatigue Life; Fretting; Protective Coatings; Titanium Alloys

28

PROPELLANTS AND FUELS

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

20010086632 Argonne National Lab., IL USA

Development of Defense Ceramic Membranes for Hydrogen Separation

Lee, T. H.; Zhang, G.; Dorris, S. E.; Balachandran, U.; Rothenberger, K. S.; Sep. 2000; 12p; In English

Report No.(s): DE2001-768578; ANL/ET/CP-102103; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We developed novel cermet (i.e., ceramic-metal composite) membranes for separating hydrogen from gas mixtures at high temperature and pressure. The hydrogen permeation rate in the temperature range of 600-900 C was determined for three classes of cermet membranes (ANL-1, ANL-2, and ANL-3). Among these membranes, ANL-3 showed the highest hydrogen permeation rate, with a maximum flux of 3.2 cc/min-sq cm for a 0.23-mm-thick membrane at 900 C. Effects of membrane thickness and hydrogen partial pressure on permeation rate indicated that bulk diffusion of hydrogen is rate-limiting for ANL-3 membranes. The lack of degradation in permeation rate during exposure to a simulated syngas mixture suggests that ANL-3 membranes are chemically stable and suitable for long-term operation.

NTIS

Ceramics; Membranes; Fabrication; Hydrogen; Gas Mixtures

20010087669 North American Aviation, Inc., Los Angeles, CA USA

Properties and Handling and Storage Characteristics of Ethyl Alcohol and Liquid Oxygen

Kanarek, I. A., North American Aviation, Inc., USA; Pratas, C., North American Aviation, Inc., USA; Jul. 11, 1947; 135p; In English

Report No.(s): AL-128; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The purpose of this report is to make available properties and handling and storage characteristics of ethyl alcohol and liquid oxygen. This information will be helpful in the development and design of the ethyl alcohol-liquid oxygen rocket propulsion system and in the handling and storage problems of experimental operation.

Derived from text

Ethyl Alcohol; Liquid Oxygen; Liquid Rocket Propellants; Spacecraft Propulsion; Propellant Properties; Propellant Storability

20010089129 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Redesign of the Stand-Off Test Final Report

Boers, M. N., Prins Maurits Lab. TNO, Netherlands; Makkus, J. C., Prins Maurits Lab. TNO, Netherlands; vanRooijen, M. P., Prins Maurits Lab. TNO, Netherlands; June 2001; 38p; In English; Original contains color illustrations

Contract(s)/Grant(s): A98/KLu/505; TNO Proj. 014.12972

Report No.(s): TD2001-0030; PML-2001-A30; Copyright; Avail: Issuing Activity

Ignitability and ignition capacity of energetic components are important parameters in the functioning of munition articles. In order to test these parameters and to measure the effect of certain types of loading, e.g., shock or artificial ageing, a few years ago a stand-off test was developed at the TNO Prins Maurits Laboratory (TNO-PML). This test set-up had two drawbacks, the vulnerability and the cleaning difficulties. In this report the redesign of the stand-off test is described. The set-up must be able to test up to 5 g of powder, be less vulnerable and easy to operate and clean. The redesign is based on the experience in former work and some characterisation tests. The first test series in the new set-up are carried out with a squib and black powder. The results are satisfactory, except the variation in the igniter output. Furthermore an effect of the size of the vent holes on the ignition

is found. These drawbacks will be researched and solved in the next part of the project. The vent holes will be covered with bursting disks and another type of igniter will be selected to reduce the variation and make test with smokeless powder possible.

Author

Igniters; Ignition; Performance Tests; Design Analysis; Explosives

20010089240 National Renewable Energy Lab., Golden, CO USA

Alternative Fuel Transit Buses: DART's LNG Bus Fleet Final Report

Oct. 2000; 52p; In English; Original contains color illustrations

Report No.(s): DE2001-775878; NREL/BR-540-28739; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Table of Contents: Executive summary; Overview; DART's Facilities and bulk fuel storage; Project Start-up at DART; Evaluation results; LNG technology progress in Transit; Summary and Conclusions; Future LNG operations at DART; Contacts; References and related reports; Appendix A. Fleet summary statistics and Appendix B. Emissions test results.

NTIS

Liquefied Natural Gas; Rapid Transit Systems; Exhaust Emission

29

SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see 84 Law, Political Science and Space Policy.

20010083352 NASA Glenn Research Center, Cleveland, OH USA

Shuttle Flight Experiment on USMP-4: In Situ Monitoring of Crystal Growth Using MEPHISTO Final Report

Abbaschian, Reza, Florida Univ., USA; deGroh, Henry C., III, NASA Glenn Research Center, USA; Leonardi, E., New South Wales Univ., Australia; deVahlDavis, Graham, New South Wales Univ., Australia; Coriell, Sam, National Inst. of Standards and Technology, USA; Cambon, Gerard, Centre National d'Etudes Spatiales, France; June 2001; 102p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 101-43-0B

Report No.(s): NASA/TP-2001-210825; E-12743; NAS 1.60:210825; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This reports on the MEPHISTO-4 experiment on the Space Shuttle Columbia, STS-87, November 19-December 5, 1997. Involved were NASA; the University of Florida at Gainesville; groups from France that developed and built the furnace; the National Institute of Standards and Technology; The University of New South Wales, Australia; and Purdue University. This was a solidification study in which three long rods of Bismuth- 1 at.% Tin were directionally solidified. The goals were to solidify in an environment free of natural convection; to determine the relationship among solidification growth velocity, growth mode, and temperature; and determine the diffusivity of Sn in Bi. The flight samples grew with a planar solid/liquid interface at velocities less than 3.4 gm/s, and cellular growth was present at velocities greater than 6.7 um/s; grain orientation influenced the planar to cellular transition. The temperature gradient in the liquid was 204 K/cm. The s/l interface was flat with slight concavity. Diffusion-dominated conditions were present during MEPHISTO-4. The Seebeck technique was used to determine the s/l interface temperature during growth, however, to date, analysis of the Seebeck results has not yielded a reliable measurement of the interface temperature. The partition coefficient for Bi alloyed with Sn was measured, $k = 0.029$.

Author

Crystal Growth; Space Shuttles; Bismuth; Tin; Directional Solidification (Crystals); Computational Fluid Dynamics

20010084630 NASA Marshall Space Flight Center, Huntsville, AL USA

A Test of Macromolecular Crystallization in Microgravity: Large, Well-Ordered Insulin Crystals

Borgstahl, Gloria E. O., Toledo Univ., USA; Vahedi-Faridi, Ardeschir, Toledo Univ., USA; Lovelace, Jeff, Toledo Univ., USA; Bellamy, Henry D., Stanford Univ., USA; Snell, Edward H., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Crystals of insulin grown in microgravity on space shuttle mission STS-95 were extremely well-ordered and unusually large (many are greater than 2 mm). The physical characteristics of six microgravity and six earth-grown crystals were examined by X-ray analysis employing superfine f slicing and unfocused synchrotron radiation. This experimental setup allowed hundreds of

reflections to be precisely examined for each crystal in a short period of time. The microgravity crystals were on average 34 times larger, had 7 times lower mosaicity, had 54 times higher reflection peak heights and diffracted to significantly higher resolution than their earth grown counterparts. A single mosaic domain model could account for reflections in microgravity crystals whereas reflections from earth crystals required a model with multiple mosaic domains. This statistically significant and unbiased characterization indicates that the microgravity environment was useful for the improvement of crystal growth and resultant diffraction quality in insulin crystals and may be similarly useful for macromolecular crystals in general.

Author

Crystallization; Microgravity; Crystal Growth; X Ray Analysis; Diffraction

20010084644 NASA Ames Research Center, Moffett Field, CA USA

Capillary Movement of Liquid in Granular Beds in Microgravity

Yendeler, Boris S., Bionetics Corp., USA; Webbon, Bruce, NASA Ames Research Center, USA; Podolski, Igor, Moscow Inst. of Biomedical Problems, Russia; Bula, Raymond J., Wisconsin Univ., USA; [1994]; 2p; In English; 30th COSPAR Scientific Assembly and Associated Events, 11-21 Jul. 1994, Hamburg, Germany; Sponsored by Committee on Space Research, Unknown Contract(s)/Grant(s): RTOP 199-61-62; No Copyright; Avail: Issuing Activity; Abstract Only

A more complete understanding of the dynamics of capillary flow through an g unsaturated porous medium would be useful for a number of space and terrestrial applications. One such application involves the development of an effective water and nutrient delivery system for the growth of plants in space. An experiment was conducted on the Mir Space Station that used an experimental cuvette called "Capillary Test Bed". An objective of this experiment was to compare fluid migration in the "Capillary Test Bed" under terrestrial laboratory simulated microgravity conditions by positioning the cuvette such that the hydrostatic force is negated and on Mir at microgravity conditions. Difference in fluid migration in the cuvette were observed. Based on these observations, improvements in the design of the cuvette are under-way that should allow for collection of more precise data in future flight experiments. The results of the MIR experiment and modifications being made to the cuvette for improved data collection will be discussed.

Author

Microgravity; Capillary Flow; Hydrostatics; Data Acquisition

20010086218 NASA Marshall Space Flight Center, Huntsville, AL USA

New Directions in NASA's Materials Science Program

Gillies, Donald C., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Conference and Exhibit on International Space Station Utilization, 15-18 Oct. 2001, Cape Canaveral, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Recently, NASA's Microgravity Research Division was re-aligned to match the Agency's increasing awareness of the importance of biological and nano-structural sciences. The Division has become the Physical Sciences Research section within the newly created Office of Biological and Physical Research. Within materials science and in the last few years, new programs aimed at biomaterials have been initiated. Results from these programs and also new research pertaining to materials for radiation protection will be discussed.

Author

Microgravity; NASA Programs; Nanostructures (Devices)

20010086233 NASA Marshall Space Flight Center, Huntsville, AL USA

Innovative Technologies for a Space Station Microgravity Furnace

Carswell, B., Alabama Univ., USA; Crouch, M., NASA Marshall Space Flight Center, USA; Farmer, J., NASA Marshall Space Flight Center, USA; Breeding, S., NASA Marshall Space Flight Center, USA; Rose, F., PWI; [2001]; 1p; In English; Conference and Exhibit on International Space Station Utilization, 15-18 Oct. 2001, Cape Canaveral, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Several Innovations were developed for a high gradient directional solidification vacuum furnace with quench capability, called the Quench Module Insert. The QMI hot zone employs advanced heater elements in a multiple zone configuration and uses a novel instrumentation approach for temperature control. A fiber interface material provides a low friction, high heat extraction interface between a reconfigurable cold zone and the science sample. The quench utilizes a metal phase change to provide rapid, resource efficient quenching of science samples. This paper provides conceptual details and performance data on these innovations.

Author

Microgravity; Quenching; High Vacuum; Vacuum Furnaces; Approach Control

20010086594 NASA Marshall Space Flight Center, Huntsville, AL USA

Quench Module Insert Capabilities and Development Test Results

Carswell, B., Alabama Univ., USA; Crouch, M., NASA Marshall Space Flight Center, USA; Farmer, J., NASA Marshall Space Flight Center, USA; Breeding, S., NASA Marshall Space Flight Center, USA; Rose, F., PWI; [2001]; 1p; In English; Conference and Exhibit on International Space Station Utilization, 15-18 Oct. 2001, Cape Canaveral, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Quench Module Insert is a directional solidification furnace, which will fly in the Materials Science Research Facility. The QMI provides high thermal gradient and quench capabilities for processing metals and alloys in microgravity. This paper will describe the capabilities and present of on-going analysis and development testing.

Author

Furnaces; Quenching; Inserts; Microgravity; Directional Solidification (Crystals)

31

ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see categories 32 through 39.

20010083878 Brookhaven National Lab., Upton, NY USA

Measurement Uncertainties in the Delta Q Test for Duct Leakage

Andrews, J. W.; Nov. 2000; 44p; In English

Report No.(s): DE2001-773962; BNL-67894; No Copyright; Avail: Department of Energy Information Bridge

Theoretical and field-test results are reported on a new method for measuring air leakage in residential duct systems. This test, called the Delta Q test by its developers, involves a set of 10 or 11 pairs of measurements using a calibrated fan (blower door). Each pair of measurements is performed with the house pressurized or depressurized to a different pressure with respect to outside. One test in each pair is conducted with the system fan on, the other with it off. Each pair of measurements gives a linear equation in two unknowns, where the unknowns are the air leakage rates (under normal operating conditions) from the supply ducts to outside and into the return ducts from outside. The straight lines represented by these equations rarely intersect at a single point, so a least-squares fit is used to find the best compromise value for the supply and return leakage rates. This report describes a theoretical analysis of errors resulting from mismatches between the assumed and actual operating conditions in the ducts and from uncertainties in the blower-door air flow measurements. It develops a way to estimate the probable errors on a house-specific basis, using the data from a single application of the Delta Q test. Finally, it applies this analysis to field-test results from two houses.

NTIS

Ducts; Leakage; Flow Measurement; Air Flow; Error Analysis

20010086588 Oak Ridge National Lab., TN USA

Review of Orifice Plate Steam Traps

Oland, C. B.; January 2001; 40p; In English

Report No.(s): PB2001-106589; ORNL/TM-2000/353/R1; No Copyright; Avail: National Technical Information Service (NTIS)

This guide was prepared to serve as a foundation for making informed decisions about when orifice plate steam traps should be considered for use in new or existing steam systems. It presents background information about different types of steam traps and defines their unique functional and operational characteristics. The advantages and disadvantages associated with using orifice plate steam traps are provided to highlight their capabilities and limitations. Finally, recommendations for using orifice plate steam traps are presented, and possible applications are identified.

NTIS

Traps; Steam; Orifices

20010087681 NASA Marshall Space Flight Center, Huntsville, AL USA

MSFC Surface Metrology (Surface Morphology)

Shapiro, Alan P., NASA Marshall Space Flight Center, USA; [2001]; 7p; In English; MSFC Technology Day, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

NASA's Surface Metrology is presented in viewgraph form. The topics include: 1) Facilities/Major Equipment; 2) Taylor Hobson NanoStep II; 3) Topometrix; and 4) Surface Metrology Applications.

CASI

Metrology; Morphology; Surface Geometry

20010088092 NASA Langley Research Center, Hampton, VA USA

Screws, Propellers and Fans Based on a Mobius Strip

Seiner, John M., NASA Langley Research Center, USA; Backley, Floyd D., NASA Langley Research Center, USA; Gilinsky, Mikhail, Hampton Univ., USA; [1998]; 11p; In English; 4th Aeronautics Conference, 2-4 Jun. 1998, Toulouse, France; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA/CEAS-98-2260; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A Mobius strip concept is intended for improving the working efficiency of propellers and screws. Applications involve cooling, boat propellers, mixing in appliance, blenders, and helicopters. Several Mobius shaped screws for the average size kitchen mixers have been made and tested. The tests have shown that the mixer with the Mobius shaped screw pair is most efficient, and saves more than 30% of the electric power by comparison with the standard. The created video film about these tests illustrates efficiency of Mobius shaped screws.

Author

Screws; Propeller Blades; Design Analysis; Efficiency; Turbomachine Blades; Shape Optimization; Structural Design; Fan Blades; Analytic Geometry; Functional Design Specifications; Ellipticity

20010089228 NASA Langley Research Center, Hampton, VA USA

Multifunctional Collaborative Modeling and Analysis Methods in Engineering Science

Ransom, Jonathan B., NASA Langley Research Center, USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Engineers are challenged to produce better designs in less time and for less cost. Hence, to investigate novel and revolutionary design concepts, accurate, high-fidelity results must be assimilated rapidly into the design, analysis, and simulation process. This assimilation should consider diverse mathematical modeling and multi-discipline interactions necessitated by concepts exploiting advanced materials and structures. Integrated high-fidelity methods with diverse engineering applications provide the enabling technologies to assimilate these high-fidelity, multi-disciplinary results rapidly at an early stage in the design. These integrated methods must be multifunctional, collaborative, and applicable to the general field of engineering science and mechanics. Multifunctional methodologies and analysis procedures are formulated for interfacing diverse subdomain idealizations including multi-fidelity modeling methods and multi-discipline analysis methods. These methods, based on the method of weighted residuals, ensure accurate compatibility of primary and secondary variables across the subdomain interfaces. Methods are developed using diverse mathematical modeling (i.e., finite difference and finite element methods) and multi-fidelity modeling among the subdomains. Several benchmark scalar-field and vector-field problems in engineering science are presented with extensions to multidisciplinary problems. Results for all problems presented are in overall good agreement with the exact analytical solution or the reference numerical solution. Based on the results, the integrated modeling approach using the finite element method for multi-fidelity discretization among the subdomains is identified as most robust. The multiple-method approach is advantageous when interfacing diverse disciplines in which each of the method's strengths are utilized. The multifunctional methodology presented provides an effective mechanism by which domains with diverse idealizations are interfaced. This capability rapidly provides the high-fidelity results needed in the early design phase. Moreover, the capability is applicable to the general field of engineering science and mechanics. Hence, it provides a collaborative capability that accounts for interactions among engineering analysis methods.

Author

Computerized Simulation; Assimilation; Systems Engineering

20010089243 Argonne National Lab., Advanced Photon Source Div., IL USA

McCarter Superfinish Grinding for Silicon: An Update

Anthony, F.; Khounsary, A.; McCarter, D.; Krasnicki, F.; Tangedahl, M.; 2000; 16p; In English

Report No.(s): DE2001-768602; ANL/UPD/CP-103225; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A grinding technique, discussed and certain referred to as the McCarter Superfinish, for grinding large size optical components is surface characterization information about flatness and the relative magnitude of the subsurface damage in silicon substrates is reported. The flatness measurements were obtained with a Zygo surface analyzer, and the substrate damage

measurements were made by x-ray diffraction and acid etching. Results indicate excellent control of flatness and fine surface finish. X-ray measurements show that the diamond wheels with small particle sizes used in the final phases of the grinding operation renders surfaces with relatively small subsurface damage.

NTIS

Silicon Carbides; Surface Finishing; Grinding Machines; Residual Stress

20010089251 Veridian Systems, Inc., Systems Div., Yorktown, VA USA

Challenges Facing Design and Analysis Tools

Knight, Norman F., Jr., Veridian Systems, Inc., USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The design and analysis of future aerospace systems will strongly rely on advanced engineering analysis tools used in combination with risk mitigation procedures. The implications of such a trend place increased demands on these tools to assess off-nominal conditions, residual strength, damage propagation, and extreme loading conditions in order to understand and quantify these effects as they affect mission success. Advances in computer hardware such as CPU processing speed, memory, secondary storage, and visualization provide significant resources for the engineer to exploit in engineering design. The challenges facing design and analysis tools fall into three primary areas. The first area involves mechanics needs such as constitutive modeling, contact and penetration simulation, crack growth prediction, damage initiation and progression prediction, transient dynamics and deployment simulations, and solution algorithms. The second area involves computational needs such as fast, robust solvers, adaptivity for model and solution strategies, control processes for concurrent, distributed computing for uncertainty assessments, and immersive technology. Traditional finite element codes still require fast direct solvers which when coupled to current CPU power enables new insight as a result of high-fidelity modeling. The third area involves decision making by the analyst. This area involves the integration and interrogation of vast amounts of information - some global in character while local details are critical and often drive the design. The proposed presentation will describe and illustrate these areas using composite structures, energy-absorbing structures, and inflatable space structures. While certain engineering approximations within the finite element model may be adequate for global response prediction, they generally are inadequate in a design setting or when local response prediction is critical. Pitfalls to be avoided and trends for emerging analysis tools will be described.

Author

Mathematical Models; Design Analysis; Decision Making; Aerospace Systems

20010089367 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

Investigation of Gravity Waves VIA the Rotational Temperature of Hydroxyl Nightglow

Willingham, Erin C.; Mar. 2001; 80p; In English

Report No.(s): AD-A392536; AFIT/GM/ENP/01M-09; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Measurement of the vibration and rotation bands of mesospheric hydroxyl radicals (OH) has been conducted during the past two decades using ground-based and space-based interferometers to take temperature and wind measurements from 70-100 km in altitude. Gravity waves that pass through the mesosphere can be measured by determining the variance over time of the rotational temperature of the OH emissions. Several attempts were made to take spectrum measurements of the nightglow from hydroxyl radicals in the mesosphere using a custom hardware configuration that included a telescope and grating monochromator optimized for the visible and near infrared. Quantifying gravity wave activity was the ultimate objective of this experiment. No spectrum of OH nightglow was recorded. The instrumentation was not sensitive enough to pick up the weak signal. This thesis is primarily a characterization of the equipment, its capabilities, and its limitations.

DTIC

Gravity Waves; Nightglow; Vibration Measurement; Hydroxyl Radicals; Wind Measurement; Hydroxyl Emission

32

COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 Space Communications, Spacecraft Communications, Command and Tracking; for search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

20010083996 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan

An Adaptive ARMA-D Modeling using an Analytic Signal

Horita, Eisuke, Hokkaido Univ., Japan; Miyazaki, Yoshikazu, Hokkaido Univ., Japan; Tochitani, Koji, Hokkaido Univ., Japan;

Bulletin of the Faculty of Engineering; February 1994; ISSN 0385-602X, No. 168, pp. 39-48; In Japanese; Copyright Waived; Avail: Issuing Activity

In this paper, a complex adaptive spectral estimation method of speech signals is proposed. Speech signals are transformed in this method to analytic signals. A pre-processing is applied to compensate the discontinuity of a spectrum in decimated analytic signals. Furthermore, tracking ability of the complex adaptive method is discussed. It is shown from the results of experiments that the proposed method has better tracking ability than conventional adaptive methods and estimates higher accurate power spectra of speech signals than conventional real adaptive methods.

Author

Autoregressive Moving Average; Verbal Communication; Speech

20010084303 National Inst. of Justice, Washington, DC USA

Antenna System Guide

Kissick, W. A.; Ingram, W. J.; Vanderau, J. M.; Jennings, R. D.; 2000; 80p; In English

Report No.(s): PB2001-107328; NCJ-185030; NIJ GUIDE-202-00; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Radio communications are essential to the operations of Federal, State, and local law enforcement and correction agencies. Effective and reliable communications systems not only enable personnel to perform their functions efficiently, but also help ensure their safety. It is, therefore, very important that all components of a radio communications system be selected and integrated to produce an effective design. Understanding the capabilities and limitations of a communications system ensures that it is used most effectively and that performance expectations are realistic. This guide focuses on a key portion (subsystem) of the radio communications system-the antenna system. Although the antenna itself may be the most visible element of radio communications equipment, it is often the least understood. This guide defines and describes the components of the antenna system as well as the fundamentals and characteristics of the antenna itself.

NTIS

Antenna Design; Radio Communication; Law (Jurisprudence); Communication Equipment

20010084716 Department of the Navy, Washington, DC USA

Three-Dimensional Synthetic Aperture Radar for Mine Detection and Other Uses

Pavco, John A., Inventor; Jun. 08, 2001; 17p; In English

Patent Info.: Filed 8 Jun. 2001; US-Patent-Appl-SN-09,876,137

Report No.(s): AD-D019930; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A radar system for generating a three-dimensional image includes a radar transmitter which is operable to produce a radar signal of a frequency of at least three gigahertz. A plurality of radar receiving antennas from an antenna array. The antenna array is aurally translatable. For example, in one embodiment, the antenna array is disposed along the wings of an aircraft which, in operation, flies over the intended target area. A three-dimensional image is generated from a reflected radar signal returned from the surface of an object in response to the transmitted radar signal. The radar system may be incorporated into an aircraft and adapted to detect subsurface objects such as mines buried beneath the surface of the ground as the aircraft traverses over a target area.

DTIC

Synthetic Aperture Radar; Radar Transmitters; Radar Antennas; Three Dimensional Models; Mines (Excavations)

20010084904 Jackson State Univ., Computer Science Dept., Jackson, MS USA

IP Telephony: Architecture and Growth Factor

Haile, Tesfa, Jackson State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 75-81; In English; See also 20010084895; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

IP telephony is used to send service like voice, facsimile, and/or voice-message applications between two or more computers in real time. It combines voice and data that are transported via the Internet, rather than the Public Switching Telephone Network(PSTN). IP telephony became a reality because of the H.323 specification. H.323 establishes standards for compression for audio and video data stream.

Author

Real Time Operation; Voice Communication; Telephony; Messages; Audio Data; Data Flow Analysis

20010085338 NASA Ames Research Center, Moffett Field, CA USA

Intelligent Mobile Technologies

Alena, Rick; Gilbaugh, Bruce; Glass, Brian; [2000]; 11p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Testing involves commercial radio equipment approved for export and use in Canada. Testing was conducted in the Canadian High Arctic, where hilly terrain provided the worst-case testing. SFU and Canadian governmental agencies made significant technical contributions. The only technical data related to radio testing was exchanged with SFU. Test protocols are standard radio tests performed by communication technicians worldwide. The Joint Fields Operations objectives included the following: (1) to provide Internet communications services for field science work and mobile exploration systems; (2) to evaluate the range and throughput of three different medium-range radio link technologies for providing coverage of the crater area; and (3) to demonstrate collaborative software such as NetMeeting with multi-point video for exchange of scientific information between remote node and base-base camp and science centers as part of communications testing.

Author

Internets; Radio Equipment; Performance Tests

20010085942 Norwegian Defence Research Establishment, Kjeller, Norway

Tactical Satellite Communications *Taktisk Satellittkommunikasjon*

Arneson, Vegard, Norwegian Defence Research Establishment, Norway; Farsund, Bodil Hvesser, Norwegian Defence Research Establishment, Norway; Jun. 22, 2001; 59p; In Norwegian; Original contains color illustrations

Contract(s)/Grant(s): FFIE Proj. 742/110

Report No.(s): FFI/RAPPORT-2000/03466; ISBN 82-464-0518-7; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report discusses tactical satellite communications, specifically with respect to how Norwegian terrain influences operation of manpack terminals and small vehicular terminals. Special consideration is given to rain attenuation, diffraction and vegetation attenuation. It is found that the use of manpack terminals are of limited value in Norwegian terrain due to low elevation angles of geostationary satellites. On the other hand, with vehicular terminals, this problem is easier to overcome because of increased mobility and due to the fact that the vehicles primary goal merely is to establish a communication link. In fact, this communication link could in many cases be easier to establish via satellite than by a radio link which is normal today.

Author

Satellite Communication; Mobile Communication Systems; Earth Terminals; Acoustic Attenuation; Terrain

20010085963 Defence Science and Technology Organisation, Salisbury, Australia

Quantifying Multi-Channel Receiver Calibration

Frazer, G. J.; Abramovich, Yu. I.; Jun. 2001; 48p; In English

Report No.(s): AD-A392638; DSTO-TR-1152; DODA-AR-011-867; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A novel test has been developed for measuring the maximum achievable calibration performance of a multi-channel receiving system. The test may also be used to determine the quality of a particular calibration scheme and to rank the relative performance of several calibration schemes. The test provides a quantitative measure of the dynamic range of the multi-channel receiver. We demonstrate the utility of the test by analysing two different eight channel receiver systems.

DTIC

Receivers; Calibrating; Dynamic Range; Multichannel Communication

20010086188 Sandia National Labs., Albuquerque, NM USA

Voice and Data Network of Convergence and the Application of Voice Over IP

Eldridge, J. M.; Nov. 2000; 32p; In English

Report No.(s): DE2001-769028; SAND2000-2857; No Copyright; Avail: Department of Energy Information Bridge

This paper looks at emerging technologies for converging voice and data networks and telephony transport over a data network using Internet Protocols. Considered are the benefits and drivers for this convergence. The paper describes these new technologies, how they are being used, and their application to Sandia.

NTIS

Computer Networks; Convergence; Voice Communication; Voice Data Processing

20010086428 Defence Science and Technology Organisation, Communications Div., Salisbury, Australia

The RATS Control Protocol (RCP)

Blackmore, Perry A., Defence Science and Technology Organisation, Australia; May 2001; 34p; In English
Report No.(s): DSTO-TN-0355; DODA-AR-011-854; Copyright; Avail: Issuing Activity

RATS is the real-time scheduler used in the server of the DSTO Theatre Broadcast System demonstrator. This document describes the RATS Control Protocol which is used for all communications with RATS. RCP is based on the User Datagram Protocol (UDP) and is used for all user requests, management requests, and control activity performed by RATS.

Author

Protocol (Computers); Real Time Operation; Scheduling; Controllers

20010086475 Sandia National Labs., Albuquerque, NM USA

Optical Interconnections to Focal Plane Arrays

Rienstra, J. L.; Hincklely, M. K.; Dec. 10, 2000; 40p; In English

Report No.(s): DE2001-769029; SAND2000-2882; No Copyright; Avail: Department of Energy Information Bridge

The objective of this project was to identify and refine candidate optical interconnection concepts and to demonstrate the selected concept. Several approaches for an optical data link are possible. An optical source can be located on the cold focal plane and directly modulated with the output signal voltage. Another choice involves the use of optical fibers or free space transmission across the warm-cold interface. The approach selected for this effort uses an optical source and receiver on the warm side of the interface, where power dissipation is not as critical as on the cryogenic side. A very low power optical modulation device on the cold side of the interface impresses the focal plane output signal on a free space optical beam.

NTIS

Optical Fibers; Optical Communication; Focal Plane Devices

20010087135 Defence Science and Technology Organisation, Surveillance Systems Div., Salisbury, Australia

Quantifying Multi-Channel Receiver Calibration

Frazer, G. J., Defence Science and Technology Organisation, Australia; Abramovich, Y. I., Defence Science and Technology Organisation, Australia; June 2001; 50p; In English

Report No.(s): DSTO-TR-1152; DODA-AR-011-867; Copyright; Avail: Issuing Activity

A novel test has been developed for measuring the maximum achievable calibration performance of a multi-channel receiving system. The test may also be used to determine the quality of a particular calibration scheme and to rank the relative performance of several calibration schemes. The test provides a quantitative measure of the dynamic range of the multi-channel receiver. We demonstrate the utility of the test by analysing two different eight channel receiver systems.

Author

Calibrating; Receivers; Multichannel Communication; Instrument Compensation; Performance Tests

20010088352 National Environmental Satellite Service, Camp Springs, MD USA

MSU Antenna Pattern Data

Mo, Tsan, National Oceanic and Atmospheric Administration, USA; Kleespies, Thomas J., National Oceanic and Atmospheric Administration, USA; Green, J. Philip, Polar Operational Environmental Satellite, USA; March 2000; 20p; In English; Also available on CD-ROM in PDF format, IPS 2001145984

Report No.(s): NOAA-TR-NESDIS-94; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Microwave Sounding Unit (MSU) antenna pattern data for nine MSU Flight Models (FMs) have been successfully rescued from 22-year old 7-track and 9-track magnetic tapes and cartridges. These antenna pattern data were unpacked into user-friendly ASCII format, and are potentially useful for making antenna pattern corrections to MSU antenna temperatures in retrieving the true brightness temperatures. We also properly interpreted the contents of the data and show how to convert the measured antenna signal amplitude in volts into relative antenna power in dB with proper normalization. It is found that the data are of high quality with a 60-dB drop in the co-polarized antenna patterns from the central peak value to its side-lobe regions at scan angles beyond 30 deg. The unpacked antenna pattern data produced in this study provide a useful database for data users to correct the antenna side-lobe contribution to MSU measurements. All of the data are available to the scientific community on a single CD-ROM.

Author

Antenna Radiation Patterns; Microwave Sounding; Data Structures; Data Bases

20010088362 Joint Test Force, Kirtland AFB, NM USA

Electronic Warfare Test, Phase 2 Interim Report, 19 Sep. 1998 - 30 Sep. 1999

Wright, Darrell L.; Sep. 30, 1999; 139p; In English

Report No.(s): AD-A390438; JADS, JT&E-TR-99-013; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

The Joint Advanced Distributed Simulation Joint Test Force (JADS JTF) was chartered by the Deputy Director, Test, Systems Engineering, and Evaluation (Test and Evaluation), Office of the Secretary of Defense (Acquisition and Technology) in October 1994 to investigate the utility of advanced distributed simulation (ADS) technologies for support of development test and evaluation (DT&E) and operational test and evaluation (OT&E). The Electronic Warfare (EW) Test was chartered separately in 1996 and was designed to evaluate the utility of distributed simulations to the EW T&E community. The system under test was an ALQ-131 self-protection jammer pod flown on an F-16 aircraft. The emphasis of the test was on the performance of the ADS components and their contribution to testing rather than on the self-protection jammer test item itself. This report describes Phase II of the EW Test, which provided ADS and digital system model (DSM) performance data for comparison with Phase I open air range data and Phase III installed system test facility data.

DTIC

Test Facilities; Systems Engineering; Electronic Warfare

20010088368 National Environmental Satellite Service, Camp Springs, MD USA

MSU Antenna Pattern Data

Mo, Tsan, National Environmental Satellite Service, USA; Kleespies, Thomas J., National Environmental Satellite Service, USA; Green, J. Philip, Polar Operational Environmental Satellite, USA; March 2000; 7p; In English; CD-ROM contains full text document in PDF format; Also available in hardcopy, IPS 2001146000

Report No.(s): NOAA-TR-NESDIS-94; No Copyright; Avail: CASI; C01, CD-ROM

The Microwave Sounding Unit (MSU) antenna pattern data for nine MSU Flight Models (FMs) have been successfully rescued from 22-year old 7-track and 9-track magnetic tapes and cartridges. These antenna pattern data were unpacked into user-friendly ASCII format, and are potentially useful for making antenna pattern corrections to MSU antenna temperatures in retrieving the true brightness temperatures. We also properly interpreted the contents of the data and show how to convert the measured antenna signal amplitude in volts into relative antenna power in dB with proper normalization. It is found that the data are of high quality with a 60-dB drop in the co-polarized antenna patterns from the central peak value to its side-lobe regions at scan angles beyond 30 deg. The unpacked antenna pattern data produced in this study provide a useful database for data users to correct the antenna side-lobe contribution to MSU measurements. All of the data are available to the scientific community on a single CD-ROM.

Author

Microwave Sounding; Antenna Radiation Patterns; Data Structures; Data Bases

20010088776 NASA Goddard Space Flight Center, Greenbelt, MD USA

Inherent and Apparent Scattering Properties of Coated or Uncoated Spheres Embedded in an Absorbing Host Medium

Yang, P., NASA Goddard Space Flight Center, USA; Gao, B.-C., Naval Research Lab., USA; Wiscombe, W. J., NASA Goddard Space Flight Center, USA; Mishchenko, M. I., NASA Goddard Inst. for Space Studies, USA; Platnick, S., NASA Goddard Space Flight Center, USA; Huang, H.-L., Wisconsin Univ., USA; Baum, B. A., NASA Langley Research Center, USA; Hu, Y. X., NASA Langley Research Center, USA; Winkler, D., NASA Langley Research Center, USA; Tsay, S.-C., NASA Goddard Space Flight Center, USA; [2001]; 48p; In English; Sponsored in part by MODIS, PICASSO-CENA and Wisconsin GIFTS/IOMI-MURI Project

Contract(s)/Grant(s): DE-AI02-00ER-62901; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The conventional Lorenz-Mie formalism is extended to the scattering process associated with a coated sphere embedded in an absorbing medium. It is shown that apparent and inherent scattering cross sections of a scattering particle, which are identical in the case of transparent host medium, are different if the host medium is absorptive. Here the inherent single-scattering properties are derived from the near-field information whereas the corresponding apparent counterparts are derived from the far-field asymptotic form of the scattered wave with scaling of host absorption that is assumed to be in an exponential form. The formality extinction and scattering efficiencies defined in the same manner as in the conventional sense can be unbounded. For a nonabsorptive particle embedded in an absorbing medium, the effect of host absorption on the phase matrix elements associated with polarization is significant. This effect, however, is largely reduced for strongly absorptive particles such as soot. For soot particles coated with water, the impurity can substantially reduce the single-scattering albedo of the particle if the size parameter is small. For water-coating soot and hollow ice spheres, it is shown that the phase matrix elements $-P_{12}/P_{11}$ and P_{33}/P_{11} are unique if the shell is thin, as compared with the case for thick shell. Furthermore, the radiative transfer equation

regarding a multidisperse particle system in an absorbing medium is discussed. It is illustrated that the conventional computation algorithms can be applied to solve the multiple scattering process if the scaled apparent single-scattering properties are applied.

Author

Scattering; Scattering Cross Sections; Spheres; Formalism

20010089084 Naval Academy, Annapolis, MD USA

Assessment of Radio Frequency Propagation in a Naval Shipboard Environment

Estes, Daniel R.; May 07, 2001; 129p; In English

Report No.(s): AD-A392407; USNA-TSPR-280; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Navy, in an effort to reduce costs and operate within future budgetary constraints, is planning to reduce the manning on combat ships. To support this reduction in manning, several wireless technologies are being considered, including wireless LANs and a wireless sensor system augmented by a computer-controlled log keeping system. The internal volume of a combat ship is a generally un-studied wireless environment. While a preliminary study demonstrated that radio energy can be radiated and received from compartment to compartment (room to room) within a ship, a detailed analysis of this environment has not been done. In this project, data was collected aboard decommissioned and active ships to characterize the wireless channel on combat ships and to attempt to determine the effect of bulkheads (walls) and hatches (doors) on the information path. Both narrowband and ultra-wideband techniques have been used to demonstrate and measure transmissions through the shipboard environment. Each bulkhead attenuated the test signal roughly 20dB. Computer modeling of the bulkhead supported the hypothesis that the radio energy is propagating through the non-conductive structures within the bulkhead - hatch seals, for example - rather than through the steel.

DTIC

Radio Frequencies; Wireless Communication; Local Area Networks

20010089131 Institute for Human Factors TNO, Soesterberg, Netherlands

Team Design for Command and Control: A Review of the Literature and Hypothetical Theoretical Framework *Interim Report Teamontwerp voor Command and Control: Literatuurstudie en Hypothetisch Theoretisch Kader*

Schraagen, J. M. C., Institute for Human Factors TNO, Netherlands; May 02, 2001; 54p; In English

Contract(s)/Grant(s): 013.60061; TNO Proj. 791.1

Report No.(s): TD2001-0136; TM-01-B006; Copyright; Avail: Issuing Activity

The combat information center (CIC) is one of the areas on board naval ships that possibly need to be manned by fewer personnel in the future. As the functioning in the CIC is accomplished by a team of watch standers, we speak of 'team design' when we discuss principles on the basis of which future teams may be designed. Since there is a lack of psychologically motivated principles for team design at present, we have conducted a literature review with the purpose of formulating those principles. The literature review has focused on six large, multi-year research efforts in the area of team design for command and control. Every research project is discussed in the following categories: background, method, major results, discussion, and implications for team design. The literature review showed that there are contradictory guidelines for team design. Some guidelines emphasize the efficiency of the team, others emphasize its failure-free performance (e.g., those derived from the research into high-reliability organizations). If the goal is efficiency, tasks should be allocated to team members in such a way that communication and coordination are minimized. This results in a team with a high level of task specialization. If the goal is failure-free performance, tasks should be shared to a large extent, there should be lots of communication among team members, and team members should have time left to help their fellow team members in hectic situations. A second major result is that there is no such thing as an optimal team structure for all situations. of great importance is to take into account the level of stability and complexity of the environment when choosing a particular team structure. We present guidelines for team design that serve both efficiency and failure-free performance goals. We also summarize the elements for team design in an input-process-output model of team performance, with special attention to the measurement of team performance in the integrated performance modeling environment (IPME).

Author

Performance Prediction; Teams; Command and Control; Personnel Management; Human Performance

ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment and microelectronics and integrated circuitry. For related information see also 60 Computer Operations and Hardware; and 76 Solid-State Physics. For communications equipment and devices see 32 Communications and Radar.

20010083251 Maryland Univ., Inst. for Plasma Research, College Park, MD USA

Research on Compact, High-Energy, Microwave Sources (MURI 1994) Final Report, 1 May 1995 - 31 Oct. 2000

Granatstein, Victor L.; Dec. 15, 2000; 74p; In English

Contract(s)/Grant(s): F49620-95-1-0358; AF Proj. 3484

Report No.(s): AD-A389221; AFRL-SR-BL-TR-01-0258; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The activity at the University of Maryland was primarily devoted to research of the following four topics: 1) frequency-multiplying gyrotron amplifiers; 2) relativistic backward wave oscillators; 3) plasma-filled microwave sources; 4) synthesis of advanced ceramics for microwave tubes. The present state of art has electron beams generated in ferroelectric guns operating at 500 kv and 300 A in 250 ns pulses. Current densities are typically less than or of order 100 A/cm², although higher current densities have been recorded from localized regions.

DTIC

Microwave Tubes; Cyclotron Resonance Devices; Radiation Sources; Ferroelectricity; Microwave Amplifiers; Ceramics

20010083605 Naval Sea Systems Command, Crane, IN USA

Recent Developments in Silver/Zinc Rechargeable Cell Studies

Lewis, Harlan L., Naval Sea Systems Command, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 21p; In English; See also 20010083604; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation discusses silver/zinc cell casing configurations and test results examining discharge capacity and silver migration comparisons. The following recommendations were proposed: 1) Use silver-treated cellophane instead of clear cellophane; 2) Use split wrap for cellophane whenever possible; and 3) Strongly consider use of sausage casing with PVA film in the following configuration: 1-mil (tubular) SC/1-mil PVA film/2.3-mil plain or 6-mil fiber-reinforced SC tubular.

CASI

Silver Zinc Batteries; Casing

20010083608 Societe des Accumulateurs Fixes et de Traction, Defense and Space Div., Poitiers, France

High Specific Energy NiH₂ Batteries for GEO Satellites

Borthomieu, Y., Societe des Accumulateurs Fixes et de Traction, France; Fabre, M., Alcatel Space Industries, France; The 2000 NASA Aerospace Battery Workshop; March 2001; 24p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation outlines the SAFT qualification status history, cell and battery modifications, overall battery characteristics, satellite programs and battery types delivered, and battery performances for selected satellite missions.

CASI

Nickel Hydrogen Batteries; Spacecraft Power Supplies; Power Efficiency

20010083609 Aerospace Corp., Electronics and Photonics Lab., El Segundo, CA USA

Capacity Management and Walkdown During LEO Cycling of Nickel-Hydrogen Cells and Batteries

Thaller, Lawrence H., Aerospace Corp., USA; Zimmerman, Albert H., Aerospace Corp., USA; To, Gloria, Aerospace Corp., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 24p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation discusses the following topics: 1) Capacity walkdown defined and illustrated; 2) Importance of capacity walkdown; 3) Four approaches to understanding the phenomenon - Pressure Trend, Charging Curve, Electrochemical Voltage Spectroscopy, and Destructive Physical Analysis Studies; 4) Results of the interrelated studies; 5) Suggested mechanism for capacity walkdown; and 6) Charging protocols to avoid the problem. In summary: 1) capacity walkdown is a consequence of the inability to maintain a high state of charge; 2) Capacity loss is typically 35% which would be expected by the valence difference between gamma and beta nickel oxyhydroxide; 3) Cycling at -5 degrees facilitates the formation of the gamma phase;

4) Excessive overcharge can also facilitate gamma phase formation at the expense of cycle life; and 5) Conditions can now be suggested to help minimize capacity walkdown.

CASI

Nickel Hydrogen Batteries; Electric Charge

20010083610 South Carolina Univ., Dept. of Chemical Engineering, Columbia, SC USA

Mathematical Modeling of Ni/H₂ and Li-Ion Batteries

Weidner, John W., South Carolina Univ., USA; White, Ralph E., South Carolina Univ., USA; Dougal, Roger A., South Carolina Univ., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 39p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

The modelling effort outlined in this viewgraph presentation encompasses the following topics: 1) Electrochemical Deposition of Nickel Hydroxide; 2) Deposition rates of thin films; 3) Impregnation of porous electrodes; 4) Experimental Characterization of Nickel Hydroxide; 5) Diffusion coefficients of protons; 6) Self-discharge rates (i.e., oxygen-evolution kinetics); 7) Hysteresis between charge and discharge; 8) Capacity loss on cycling; 9) Experimental Verification of the Ni/H₂ Battery Model; 10) Mathematical Modeling Li-Ion Batteries; 11) Experimental Verification of the Li-Ion Battery Model; 11) Integrated Power System Models for Satellites; and 12) Experimental Verification of Integrated-Systems Model.

CASI

Mathematical Models; Nickel Hydrogen Batteries; Lithium Batteries; Computerized Simulation

20010083612 Lockheed Martin Space Systems Co., Sunnyvale, CA USA

Li-ion Battery Cell Balancing Requirements, nasa marsh

Isaacson, Mark J., Lockheed Martin Space Systems Co., USA; Teofilo, Vincent L., Lockheed Martin Space Systems Co., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 35p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

In this viewgraph presentation, LI-ion battery management requirements, strategies and architectures are reviewed. UBI Li-ion cell testing under way to quantify charge balancing requirements. No evidence for need for cell balancing for UBI cells for portable commercial electronics. Conclusions for UBI portable electronics cells not necessarily applicable to other applications and other cell types.

Derived from text

Lithium Batteries; Spacecraft Power Supplies; Electric Potential

20010083615 SAFT America, Inc., Cockeysville, MD USA

Lithium Ion DD Cells Evaluation for Space Applications

Croft, Haiyan, SAFT America, Inc., USA; Staniewicz, Bob, SAFT America, Inc., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 24p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation gives an overview of the chemistry involved in lithium ion DD Cells, a characterization of the DD cells, how accelerated testing is performed, the calendar results observed, some testing results, and the predicted cycle life.

Derived from text

Lithium Batteries; Accelerated Life Tests; Service Life

20010083619 University of the Pacific, Forest Grove, OR USA

Characterization of Electrolytes by Computer Modeling

Moore, Brandy, University of the Pacific, USA; Whitely, Richard, University of the Pacific, USA; Currie, James, University of the Pacific, USA; Johnson, Kevin, University of the Pacific, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 26p; In English; See also 20010083604; Sponsored in part by the Murdoch Charitable Trust; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation discusses electrolyte requirements, solvent characterization, the general problem of the electrolyte's ability to be reduced in lieu of Li(+) ion reduction/intercalation, how the S.E.I works, free energy mappings, charge distribution, reaction pathways, Li(+) ion solvation, and presents the general question of whether electrolyte solvent behavior can be predicted through computer modeling.

CASI

Electrolytes; Lithium Batteries; Free Energy; Computerized Simulation

20010083621 Eagle-Picher Energy Products, Vancouver, British Columbia Canada

Large Lithium Ion Batteries Aerospace and Aircraft Applications

Bruce, Gregg C., Eagle-Picher Energy Products, Canada; Marcoux, Lynn, Eagle-Picher Energy Products, Canada; The 2000 NASA Aerospace Battery Workshop; March 2001; 5p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A01, Hardcopy

Eagle-Picher Energy Products (EPEP) has been manufacturing and testing large lithium ion cells (up to 100-Ah) for several years. Recently, work has focused on testing of different chemistries at variable temperatures and designing and fabricating 100-Ah cylindrical cells. For the aircraft application the largest concern is irreversible capacity loss at elevated temperatures (70 C). In contrast, for the aerospace application shelf-life and cycle life is critical. EPEP has found that the major contributor to the loss in low temperature performance due to high temperature testing was the positive electrode. Eagle-Picher Energy Products will discuss recent results of variable temperature cycling and 100-Ah cell performance.

Author

Service Life; Storage Stability; Lithium Batteries; Spacecraft Power Supplies

20010083623 NASA Goddard Space Flight Center, Greenbelt, MD USA

NASA/GSFC Testing of Li-Ion Cells: Update

Vaidyanathan, Hari, Lockheed Martin Telecommunications, USA; Rao, Gopalakrishna M., NASA Goddard Space Flight Center, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 16p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph paper presents a report on the ongoing testing of Lithium Ion (Li-Ion) cells. Characterizes cells according to capacity, self-discharge, and mid-discharge voltage. Determines the cycling performance of Li-Ion cells as batteries according to number of cycles, charge voltage, and temperature.

CASI

Lithium Batteries; Electrolytic Cells; Performance Tests

20010083630 Wilson Greatbatch Ltd., Clarence, NY USA

On the Behavior of Lithium Ion Batteries During Short Circuit and Extended Overcharge

Leising, Randolph A., Wilson Greatbatch Ltd., USA; Palazzo, Marcus J., Wilson Greatbatch Ltd., USA; Spillman, David M., Wilson Greatbatch Ltd., USA; Takeuchi, Esther S., Wilson Greatbatch Ltd., USA; Takeuchi, Kenneth J., State Univ. of New York, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 33p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

The safety of lithium ion batteries under abusive conditions is a primary concern of battery manufacturers and their customers. Placement of thermocouples within a battery will provide more accurate information on the internal temperature during these reactions. Short circuit conditions or extreme overcharge of lithium ion batteries may result in high temperatures, and can lead to violent reactions under some circumstances. External short circuit tests were conducted on medium sized prismatic batteries while the voltage, current, case temperature, and internal temperature were monitored and recorded. The rate of overcharge was systematically varied for batteries having the same cell balance. Extended overcharge tests were conducted on medium size prismatic batteries which contained thermocouples that were positioned within the wound electrode stack. The effects of cell balance, i.e. ratio of lithiated cobalt oxide to carbon weight, on the overcharge reaction was investigated. Partially delithiated cathodes were placed into batteries containing non-lithiated anodes and subjected to an extended overcharge test. Several mechanisms may contribute to lithium ion battery instability during abusive conditions.

Derived from text

Lithium Batteries; Short Circuits; Electrolytic Cells; Performance Tests; Destructive Tests

20010083873 Bechtel Nevada Corp., Las Vegas, NV USA

Selecting Test Frequencies for Two-Tone Phase Plane Analysis of ADC's

Blair, J.; 2001; 8p; In English

Report No.(s): DE2001-775389; DOE/NV/11718--476; No Copyright; Avail: Department of Energy Information Bridge

We show how to select the frequencies for a two-tone sine wave test for an analog to digital converter. The frequencies are selected in a manner to guarantee nearly uniform coverage of a selected ellipse in the phase plane. A proof that the selected frequencies provide the desired coverage is given.

NTIS

Analog to Digital Converters; Sine Waves; Frequencies

20010084269 Syracuse Univ., NY USA

HOL2GDT a Formal Verification-Based Design Methodology Final Report, Sep. 1997 - Mar. 1999

Chavan, Anand; Woo Min, Byoung; Chin, Shiu-Kai; Apr. 2001; 122p; In English

Contract(s)/Grant(s): F30602-97-C-0310; AF Proj. 5581

Report No.(s): AD-A390708; AFRL-IF-RS-TR-2001-47; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

HOL2GDT is a VLSI design methodology. It starts with a design implementation description that is formally verified using the Higher Order Logic (HOL) theorem prover. This implementation description is translated into a hardware description language model by using a HOL2GDT compiler, and with this model a physical design layout is generated by using IC design placement and routing tools in Mentor Graphic's Generator Design Technology (GDT) package. Thus, the final IC layout is generated from a formally verified description. This document illustrates the design methodology in detail to serve as a manual for the HOL2GDT system. It covers (1) how to define formal implementation descriptions of the hardware design, (2) how to translate implementation descriptions into L language schematic generator models, and (3) how to get physical IC layouts from schematic models. A complete example of an n-bit Serial Multiplier design is used to illustrate the HOL2GDT design methodology.

DTIC

Program Verification (Computers); Very Large Scale Integration; Programming Languages; Mathematical Programming; Mathematical Logic

20010084298 Oak Ridge National Lab., TN USA

Radioisotope Power System Materials Production and Technology Program Tasks Quarterly Report, Jul. - Sep.

Nov. 13, 2000; 36p; In English

Report No.(s): DE2001-768440; ORNL/CF-00/34; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Office of Space and Defense Power Systems of the Department of Energy (DOE) provides Radioisotope Power Systems (RPS) for applications where conventional power systems are not feasible. For example, radioisotope thermoelectric generators were supplied by the DOE to the National Aeronautics and Space Administration for deep space missions including the Cassini Mission launched in October of 1997 to study the planet Saturn. The Oak Ridge National Laboratory (ORNL) has been involved in developing materials and technology and producing components for the DOE for more than three decades. For the Cassini Mission, for example, ORNL was involved in the production of carbon-bonded carbon fiber (CBCF) insulator sets, iridium alloy blanks and foil, and clad vent sets (CVS) and weld shields (WS). This quarterly report has been divided into three sections to reflect program guidance from Office of Space and Defense Power Systems for fiscal year (FY) 2000. The first section deals primarily with maintenance of the capability to produce flight quality (FQ) CBCF insulator sets, iridium alloy blanks and foil, CVS, and WS. In all three cases, production maintenance is assured by the manufacture of limited quantities of FQ components. The second section deals with several technology activities to improve the manufacturing processes, characterize materials, or to develop technologies for two new RPS. The last section is dedicated to studies of the potential for the production of ²³⁸Pu at ORNL.

NTIS

Thermoelectric Generators; Radioactive Isotopes; NASA Programs; Cassini Mission; Space Missions

20010084465 Department of the Navy, Washington, DC USA

Capacitively Shunted Quadrifilar Helix Antenna

Josypenko, Michael J., Inventor; Apr. 24, 2000; 30p; In English

Patent Info.: Filed 24 Apr. 2000; US-Patent-Appl-SN-09,0558,689

Report No.(s): AD-D019925; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A quadrifilar helix antenna is provided having a feedpoint for the antenna connecting to individual helical antenna elements. A capacitive network, distributed along the length of the antenna, constitutes a variable frequency shunting network. At each position a first capacitive structure, that may comprise a single capacitor or multiple capacitors in series, interconnects a first pair of opposite antenna elements; a second capacitive structure interconnects the second pair of opposite antenna elements. As an applied frequency increases, the capacitive structures progressively short the opposite antenna elements thereby electrically reducing the antenna length.

DTIC

Helical Antennas; Capacitance; Antenna Components; Frequencies

20010084714 Department of the Navy, Washington, DC USA

Break Screen Based Speed Sensing Circuit

Raposa, John R., Inventor; Thivierge, Daniel P., Inventor; Apr. 28, 2000; 17p; In English

Patent Info.: Filed 28 Apr. 2000; US-Patent-Appl-SN-09,565,234

Report No.(s): AD-D019928; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A device for sensing projectile velocity in an underwater environment is provided. The device includes a plurality of evenly spaced break screen members positioned in a path of the projectile. Each break screen member includes a support member, a pair of transparent sheets spanning the support member, a continuous resistive trace sandwiched between the transparent sheets, and a sensing member correspondingly connected to resistive trace. The sensing member includes means for outputting a signal responsive to impact of the projectile against the break screen, and a logic arrangement for determining difference between impact of at two adjacent break screens throughout the run of break screens, thereby determining a velocity of the projectile.

DTIC

Circuits; Detection; Projectiles; Velocity

20010084715 Department of the Navy, Washington, DC USA

Self-Aligned Integrally Gated Nanofilament Field Emitter Cell and Array

Hsu, David S., Inventor; Mar. 09, 2001; 42p; In English

Patent Info.: Filed 9 Mar. 2001; US-Patent-Appl-SN-09,804,641

Report No.(s): AD-D019929; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The present invention discloses a new field emitter cell and array consisting of groups of nanofilaments forming emitter cathodes. Control gates are microprocessed to be integrally formed with groups of nanofilament emitter cathodes on a substrate. Groups of nanofilaments are grown directly on the substrate material. As a result, the control gates and groups of nanofilaments are self-aligned with one another.

DTIC

Cathodes; Emitters; Nanotechnology; Arrays; Self Alignment

20010084771 NASA Marshall Space Flight Center, Huntsville, AL USA

Characterization of a Multilayered Dielectric Transmissive Phase Modulator

Keys, Andrew S., NASA Marshall Space Flight Center, USA; Fork, Richard L., Alabama Univ., USA; Nelson, Thomas R., Air Force Research Lab., USA; [2001]; 1p; In English; International Society for Optical Engineering Annual Meeting, 2 Aug. 2001, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA

Contract(s)/Grant(s): RTOP 755-08-00; No Copyright; Avail: Issuing Activity; Abstract Only

We describe a multilayered dielectric stack configuration designed specifically for use as a transmissive phase modulator for broadband optical signals. Applications for this device range from full aperture wavefront correction to nonmechanical beam steering arrays for free space optical communication links. Our implementation employs alternating GaAs and AlAs layers of varying thickness on a GaAs substrate to create a bandpass region of high average transmission centered about the one micrometer wavelength. Within this transmission bandpass, the phase component of the complex transmission coefficient varies in a near-linear fashion with respect to wavelength. The transmission bandpass is designed to have a bandwidth of 21.0 nm (or 6.3THz frequency bandwidth) and to have an edge-to-edge phase change of greater than 47T radians. Modification of the stack materials' optical properties causes the transmission profile to shift spectrally, resulting in a phase modulation for bands of transmitted frequencies. Our broadband phase modulator imparts up to a full-cycle of phase modulation with low loss and low group velocity dispersion. We identify several methods for implementing the requisite modulation, including refractive index modulation through free carrier injection and optical path length modulation through variation in angle of incidence. At least one sample comprising 91 alternating layers has been fabricated to exhibit the bandpass properties required for optical signal phase modulation. We experimentally characterize the sample using an interferometer and spectrometer to measure the transmitted signal spectrum and relative phase modulation. We compare the experimental data to computational predictions and discuss the results.

Author

Phase Modulation; Gallium Arsenides; Dielectrics; Aluminum Arsenides; Broadband; Optical Properties; Communication Networks

20010084779 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden

Background and Detection Study of EM Signals Recorded at a Sea Trial in the Baltic Sea *En Bakgrunds-Och Detektionsstudie av EM Signaler Inspelade Vid Ett Faeltfoersok i Oestersjon*

Asraf, D. E.; Lennartsson, R. F.; Dec. 2000; ISSN 1104-9154; 60p; In English

Report No.(s): PB2001-107275; FOA-R-00-01766-409-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report presents the analysis of electromagnetic data recorded at a sea trial in the Baltic Sea, in the fall of 1999. The analysis can be categorized in two sections, a comprehensive background study and a brief signal detection study. The background study is done by means of time-frequency analysis and statistical tests of the data. The time-frequency analysis shows that the two measuring units used in this study have quite different characteristics, due to the data acquisition system. From the statistical tests the authors find that the background is stationary and linear for all the sensors. It can not be determined if the background is gaussian with the gaussianity test. The detection study indicates proper functionality of the energy detector, but the overall detection performance is quite low. However, the results should be considered as a lower bound for the system. Finally, a few suggestions for modification that could improve the performance are given.

NTIS

Baltic Sea; Data Acquisition; Signal Detection; Electromagnetic Radiation

20010085333 MRJ, Inc., USA

2D Quantum Simulation of MOSFET Using the Non Equilibrium Green's Function Method

Svizhenko, Alexel, MRJ, Inc., USA; Anantram, M. P., NASA Ames Research Center, USA; Govindan, T. R., MRJ, Inc., USA; May 17, 2000; 4p; In English; International Workshop on Computational Electronics, 21-25 May 2000, UK
Contract(s)/Grant(s): DTT59-99-D-00437; RTOP 519-40-12; NASA Order A-61812-D; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objectives this viewgraph presentation summarizes include: (1) the development of a quantum mechanical simulator for ultra short channel MOSFET simulation, including theory, physical approximations, and computer code; (2) explore physics that is not accessible by semiclassical methods; (3) benchmarking of semiclassical and classical methods; and (4) study other two-dimensional devices and molecular structure, from discretized Hamiltonian to tight-binding Hamiltonian.

Derived from text

Field Effect Transistors; Green'S Functions; Two Dimensional Models; Computerized Simulation

20010085335 NASA Ames Research Center, Moffett Field, CA USA

Transport Through Carbon Nanotube Wires

Anantram, M. P., NASA Ames Research Center, USA; May 17, 2000; 4p; In English; International Workshop on Computational Electronics, 21-25 May 2000, Glasgow, UK
Contract(s)/Grant(s): DTT59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This viewgraph presentation gives an overview of the the current carrying capacity of nanotube wires. Information is given on the motivation for the research, models and assumptions, Bragg reflection and Zener tunneling effects, and the influence of defects. Results show that dI/dV versus V does not increase in a manner commensurate with the increase in the number of subbands; in small diameter nanotubes, Zener tunneling is ineffective; Zener tunneling contributes to current with increase in nanotube diameter; and the increase in dI/dV with bias is much smaller than the increase in the number of subbands.

Derived from text

Nanotubes; Wire; Zener Effect

20010089152 NASA Langley Research Center, Hampton, VA USA

Mode-Stirred Method Implementation for HIRF Susceptibility Testing and Results Comparison with Anechoic Method

Nguyen, Truong X., NASA Langley Research Center, USA; Ely, Jay J., NASA Langley Research Center, USA; Koppen, Sandra V., Lockheed Martin Corp., USA; July 2001; 21p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 706-62-11-01

Report No.(s): NASA/TM-2001-211033; NAS 1.15:211033; L-18093; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes the implementation of mode-stirred method for susceptibility testing according to the current DO-160D standard. Test results on an Engine Data Processor using the implemented procedure and the comparisons with the standard anechoic test results are presented. The comparison experimentally shows that the susceptibility thresholds found in mode-stirred method are consistently higher than anechoic. This is consistent with the recent statistical analysis finding by NIST that the current calibration procedure overstates field strength by a fixed amount. Once the test results are adjusted for this value, the comparisons with the anechoic results are excellent. The results also show that test method has excellent chamber to chamber repeatability. Several areas for improvements to the current procedure are also identified and implemented.

Author

Reverberation; Performance Tests; Data Processing Equipment

FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics.

20010083373 NASA Goddard Space Flight Center, Greenbelt, MD USA

Thermal Technology Development Activities at the Goddard Space Flight Center: 2001

Butler, Dan, NASA Goddard Space Flight Center, USA; [2001]; 81p; In English; Thermal and Fluids Analysis Workshop 2001, 2001, Huntsville, AL, USA; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Activities include the development of two phase systems which are composed of 1) heat pipes and variable conductance heat pipes, 2) capillary pumped loops, 3) loop heat pipes, 4) vapor compression systems (heat pumps), 5) phase change materials. Also in the development phase are variable emittance surfaces, advanced coatings, high conductivity materials, and electrohydrodynamic (EHD) thermal control systems.

CASI

Conductive Heat Transfer; Electrohydrodynamics; Heat Pipes; Heat Pumps; Loops; Phase Change Materials; Thermodynamics

20010084182 Florida State Univ., School of Computational Science and Information Technology, Tallahassee, FL USA

Fluid Physics Under a Stochastic Acceleration Field *Final Report*

Vinals, Jorge, Florida State Univ., USA; Jun. 12, 2001; 14p; In English

Contract(s)/Grant(s): NAG3-1885; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research summarized in this report has involved a combined theoretical and computational study of fluid flow that results from the random acceleration environment present onboard space orbiters, also known as g-jitter. We have focused on a statistical description of the observed g-jitter, on the flows that such an acceleration field can induce in a number of experimental configurations of interest, and on extending previously developed methodology to boundary layer flows. Narrow band noise has been shown to describe many of the features of acceleration data collected during space missions. The scale of baroclinically induced flows when the driving acceleration is random is not given by the Rayleigh number. Spatially uniform g-jitter induces additional hydrodynamic forces among suspended particles in incompressible fluids. Stochastic modulation of the control parameter shifts the location of the onset of an oscillatory instability. Random vibration of solid boundaries leads to separation of boundary layers. Steady streaming ahead of a modulated solid-melt interface enhances solute transport, and modifies the stability boundaries of a planar front.

Derived from text

Boundary Layer Flow; Fluid Dynamics; Fluid Flow; Incompressible Fluids; Stochastic Processes

20010084447 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

An Improved Streamline Curvature Approach for Off-Design Analysis of Transonic Compression Systems

Boyer, Keith M.; Apr. 09, 2001; 189p; In English

Report No.(s): AD-A392489; C101-77; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

A streamline curvature (SLC) throughflow numerical model was assessed and modified to better approximate the flow fields of highly transonic fans typical of military fighter applications. Specifically, improvements in total pressure loss modeling were implemented to ensure accurate and reliable off-design performance prediction. The assessment was made relative to the modeling of key transonic flow field phenomena, and provided the basis for improvements, central to which was the incorporation of a physics-based shock loss model. The new model accounts for shock geometry changes, with shock loss estimated as a function of inlet relative Mach number, blade section loading (flow turning), solidity, leading edge radius, and suction surface profile. Other improvements included incorporation of loading effects on the tip secondary loss model, use of radial blockage factors to model tip leakage effects, and an improved estimate of the blade section incidence at which minimum loss occurs. Data from a single-stage, isolated rotor and a two-stage, advanced-design (low aspect ratio, high solidity) fan provided the basis for experimental comparisons. The two-stage fan was the primary vehicle used to verify the present work. Results from a three-dimensional, steady, Reynolds-averaged Navier-Stokes model of the first rotor of the two-stage fan were also used to compare with predicted performance from the improved SLC representation. In general, the effects of important flow phenomena relative to off-design performance of the fan were adequately captured. These effects included shock loss, secondary flow, and spanwise mixing. Most notably, the importance of properly accounting for shock geometry and loss changes with operating

conditions was clearly demonstrated. The majority of the increased total pressure loss with loading across the important first-stage tip region was shown to be the result of increased shock loss, even at part-speed.

DTIC

Transonic Flow; Design Analysis; Turbofan Engines; Navier-Stokes Equation; Performance Prediction; Reynolds Equation; Rotors; Secondary Flow; Three Dimensional Models; Curvature

20010084984 Swales Aerospace, Beltsville, MD USA

A Fully Coupled Multi-Rigid-Body Fuel Slosh Dynamics Model Applied to the Triana Stack

London, K. W., Swales Aerospace, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 335-346; In English; See also 20010084958

Contract(s)/Grant(s): 2113-012; No Copyright; Avail: CASI; A03, Hardcopy

A somewhat general multibody model is presented that accounts for energy dissipation associated with fuel slosh and which unifies some of the existing more specialized representations. This model is used to predict the mutation growth time constant for the Triana Spacecraft, or Stack, consisting of the Triana Observatory mated with the Gyroscopic Upper Stage of GUS (includes the solid rocket motor, SRM, booster). At the nominal spin rate of 60 rpm and with 145 kg of hydrazine propellant on board, a time constant of 116 s is predicted for worst case sloshing of a spherical slug model compared to 1,681 s (nominal), 1,043 s (worst case) for sloshing of a three degree of freedom pendulum model.

Author

Liquid Sloshing; Rigid Structures; Dynamic Models

20010085855 Toledo Univ., Dept. of Mechanical, Industrial and Manufacturing Engineering, OH USA

Development of Advanced Casing Treatments for Flow Control Final Report, 1 Oct. 2000 - 17 Jul. 2001

Keith, Theo G., Jr., Toledo Univ., USA; Tsung, Fu-Lin, Toledo Univ., USA; August 2001; 4p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG3-2507; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Under the Base R&T and Ultra Efficient Engine Technology programs, the NASA-Goddard Space Flight Center Compressor Branch is investigating flow control strategies required to increase the loading and efficiency of core compressors while maintaining current levels of operability. Flow-control strategies being studied include advanced casing treatments, wall jet injection, and blade-tip injection for compressor stability enhancement, directed jets for surface boundary layer control, and vortex-generating devices. The use of computational fluid dynamics (CFD) simulations to assess the effectiveness of flow-control devices and to guide their design is a key element in this research. CFD simulations serve to screen potential flow-control concepts at a lower cost than executing physical experiments in turbomachinery facilities. CFD simulations also provide guidance in designing physical experiments for those flow control concepts, which appear promising.

Author

Boundary Layer Control; Computational Fluid Dynamics; Control Equipment; Injection; Potential Flow; Computerized Simulation

20010085959 Norwegian Defence Research Establishment, Kjeller, Norway

Estimation of Spectra and Transmission Losses Using FFT and Filterbanks Beregning AV Spektra OG Transmisjonstap Ved Hjelp Av FFT OG Filterbanker

Eidem, Ellen Johanne, Norwegian Defence Research Establishment, Norway; Sostrand, Knut A., Norwegian Defence Research Establishment, Norway; May 28, 2001; 46p; In Norwegian

Contract(s)/Grant(s): FFIBM Proj. 786/115

Report No.(s): FFI/RAPPORT-2001/02101; ISBN 82-464-0515-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Documentation is given of methods for computation of energy spectra and transmission losses for explosive charges under water. Sometimes this is done using filter banks. Another method is based on the FFT algorithm. In this report the two methods are discussed. An introductory review of analog and digital spectrum analysis is given, starting with classical theory and ending up with algorithms using the FFT. As part of the report, bandwidths and frequency limits for octave bands and 1/3-octave bands are discussed. Finally, computation of the transmission loss is discussed.

Author

Algorithms; Energy Spectra; Fast Fourier Transformations; Transmission Loss; Underwater Explosions; Underwater Acoustics; Power Spectra; Time Series Analysis

20010086421 Oxford Univ., Oxford UK

Vibration Reduction in Balanced Linear Compressors *Final Report*

Davey, Gordon; Apr. 04, 2001; 13p; In English

Contract(s)/Grant(s): F61775-98-2-E107

Report No.(s): AD-A392939; EOARD-SPC-98-4057; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report results from a contract tasking University of Oxford as follows: The contractor will investigate the modeling and construction of low vibration mechanical compressors.

DTIC

Compressors; Vibration Damping

20010086634 Argonne National Lab., Fusion Power Program, IL USA

Theoretical Investigation of Liquid Metal MHD Free Surface Flows for Alps

Milokov, S.; Cox, I.; Oct. 2000; 10p; In English; 14th ANS Topical Meeting on the Technology of Fusion Energy, 15-19 Oct. 2000, Park City, UT, USA; Sponsored by American Nuclear Society, USA

Report No.(s): DE2001-768576; ANLTD/CP-102011; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Free surface plasma facing components (PFCS) offer the potential to solve the lifetime issues limiting current solid surface designs for tokamak fusion reactors by eliminating the problems of erosion and thermal stresses accompanying solid surface designs. The moving PFC free surfaces provide the possibility of absorbing impurities and possibly helium for removal outside of the plasma chamber. Free surface PFCS may also offer more creative possibilities for heat removal and higher thermal conversion efficiencies for the entire system. Design requirements for PFCS include handling -50% of the plasma heat flux and approximately 90 percent of the ion flux. Magnetohydrodynamic (MHD) liquid metal flows with free surfaces are discussed with reference to Advanced Limiter-divertor Plasma-facing Systems (ALPS) program. Specific MHD issues for the jet divertor are outlined. Results for the rivulet flow and for the thermocapillary flow in a jet are presented.

NTIS

Fluid Dynamics; Numerical Analysis; Liquid Metals; Magnetohydrodynamic Flow; Plasmas (Physics)

20010086636 NASA Goddard Space Flight Center, Greenbelt, MD USA

Active Control of the Operating Temperature in a Loop Heat Pipe with Two Evaporators and Two Condensers

Ku, Jentung, NASA Goddard Space Flight Center, USA; Birur, Gaj, Jet Propulsion Lab., California Inst. of Tech., USA; [2001]; 14p; In English; 31st ICES Conference, 9 Jul. 2001, Orlando, FL, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The operating temperature of a loop heat pipe (LHP) with multiple evaporators is a function of the total heat load, heat load distribution among evaporators, condenser temperature and ambient temperature. Because of the many variables involved, the operating temperature also showed more hystereses than an LHP with a single evaporator. Tight temperature control can be achieved by controlling its compensation chamber (CC) temperatures at the desired set point. This paper describes a test program on active control of the operating temperature in an LHP with two evaporators and two condensers. Temperature control was achieved by heating one or both CC's. Tests performed included start-up, power cycle, sink temperature cycle, CC temperature cycle, and capillary limit. Test results show that, regardless one or two CC's were heated to the set point temperature, one of CC's was always flooded with liquid. The loop could operate successfully at the desired set point temperature under most conditions, including some fast transients. At low heat loads, however, the CC temperature could suddenly increase above the set point temperature, possibly due to a sudden change of the vapor content inside the evaporator core.

Author

Active Control; Heat Pipes; Operating Temperature; Temperature Control; Evaporators; Condensers (Liquefiers)

20010087133 NASA Ames Research Center, Moffett Field, CA USA

Perspectives on the Future of CFD

Kwak, Dochan, NASA Ames Research Center, USA; [2000]; 11p; In English; Fluids 2000, 19-22 Jun. 2000, Denver, CO, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation gives an overview of the future of computational fluid dynamics (CFD), which in the past has pioneered the field of flow simulation. Over time CFD has progressed as computing power. Numerical methods have been advanced as CPU and memory capacity increases. Complex configurations are routinely computed now and direct numerical simulations (DNS) and large eddy simulations (LES) are used to study turbulence. As the computing resources changed to parallel and distributed platforms, computer science aspects such as scalability (algorithmic and implementation) and portability and

transparent codings have advanced. Examples of potential future (or current) challenges include risk assessment, limitations of the heuristic model, and the development of CFD and information technology (IT) tools.

Derived from text

Computational Fluid Dynamics; Technology Utilization; Computerized Simulation; Technology Assessment

20010087663 Eloret Corp., Sunnyvale, CA USA

Radiative Interaction Between Driver and Driven Gases in an Arc-Driven Shock Tube

Bogdanoff, David W., Eloret Corp., USA; Park, Chul, Eloret Corp., USA; [2001]; 6p; In English; 23rd International Between Driver and Driven Gases in an Arc-Driven Shock Tube, 2001, Arlington, TX, USA

Contract(s)/Grant(s): NAS2-99092; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An electric-arc driven shock tube was operated with hydrogen as the driven gas and either hydrogen or helium as the driver gas. Electron density was measured behind the primary shock wave spectroscopically from the width of the Beta line of hydrogen. The measured electron density values were many times greater than the values calculated by the Rankine - Hugoniot relations. By accounting for the radiative transfer from the driver gas to the driven gas, the measured electron density values were numerically recreated.

Author

Radiative Transfer; Electric Arcs; Gas Density; Shock Tubes

20010087664 NASA Ames Research Center, Moffett Field, CA USA

On Animating 2D Velocity Fields

Kao, David, NASA Ames Research Center, USA; Pang, Alex, California Univ., USA; [2001]; 12p; In English; El Conference, 2001, USA; Sponsored by International Society for Optical Engineering, USA

Contract(s)/Grant(s): NCC2-5281; W-7406-eng-48; N66001-97-8900; NSF ACI-96-19020; LLNL-B347879; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A velocity field, even one that represents a steady state flow, implies a dynamical system. Animated velocity fields is an important tool in understanding such complex phenomena. This paper looks at a number of techniques that animate velocity fields and propose two new alternatives. These are texture advection and streamline cycling. The common theme among these techniques is the use of advection on some texture to generate a realistic animation of the velocity field. Texture synthesis and selection for these methods are presented. Strengths and weaknesses of the techniques are also discussed in conjunctions with several examples.

Author

Two Dimensional Flow; Velocity Distribution; Advection

20010088090 Maryland Univ., Inst. for Plasma Research, College Park, MD USA

Active Chaotic Flows, Deterministic Modeling, and Communication with Chaos Final Report, 1 Oct. 1999 - 31 Mar. 2001

Grebogi, Celso; Mar. 31, 2001; 8p; In English

Contract(s)/Grant(s): N00014-00-1-0006

Report No.(s): AD-A390710; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

This is the final report on this project. The objectives were threefold: (1) to study the chemical and biological activity in environmental flows often involving larger particles which are influenced by inertia, buoyance, Stokes' drag, and gravity forces; (2) to establish to what extent a natural chaotic system can be modeled deterministically; and (3) to demonstrate theoretically and experimentally that we can encode a message in a power oscillator (source) which is then transmitted through some communication channel (e.g. optical fiber, microwave antenna) to be received by a decoder which translates the message back to its original form, the goal being to use a method for synchronizing a chaotic oscillator to the incoming signal such that in-band noise is reduced.

DTIC

Chaos; Messages; Message Processing; Radio Communication

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Avionics and Aircraft Instrumentation; and 19 Spacecraft Instrumentation.

20010083370 NASA Goddard Space Flight Center, Greenbelt, MD USA

Using VIIRS to Provide Data Continuity with MODIS

Murphy, Robert E., NASA Goddard Space Flight Center, USA; Barnes, William L., NASA Goddard Space Flight Center, USA; Lyapustin, Alexei I., Maryland Univ. Baltimore County, USA; Privette, Jeffrey, Maryland Univ. Baltimore County, USA; Welsch, Carol, National Oceanic and Atmospheric Administration, USA; DeLuccia, Frank, Aerospace Corp., USA; Schueler, Carl F., Raytheon Santa Barbara Remote Sensing, USA; Ardanuy, Philip E., Raytheon Information Technology and Scientific Services, USA; Kealy, Peter S. M., Raytheon Information Technology and Scientific Services, USA; [2001]; 3p; In English; International Geoscience and Remote Sensing Symposium, 9-13 Jul. 2001, Sydney, Australia; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Long-term continuity of the data series being initiated by the MODIS (MODerate Resolution Imaging Spectroradiometer) on NASA's Terra mission will be obtained using the VIIRS (Visible Infrared Imaging Radiometer Suite) flying on the converged National Polar-Orbiting Environmental Satellite System (NPOESS) and on the NPOESS Preparatory Project (NPP). The data series include critical parameters such as cloud and aerosol properties, vegetation index, land use and land cover, ocean chlorophyll and sea surface temperature. VIIRS is being designed and built by Raytheon for the Integrated Program Office (IPO), the DoD, NOAA and NASA consortium that is responsible for NPOESS. In addition to meeting the requirements for operational environmental monitoring, VIIRS will meet the needs of the global change research community through the use of state-of-the-art algorithms and calibration and characterization activities.

Author

Aerosols; Imaging Spectrometers; Infrared Imagery; Radiometers; Spectroradiometers; Earth Observations (From Space)

20010084642 Raytheon Co., Goleta, CA USA

Readout Technology for is greater than 1K x 1K Staring Focal Plane Arrays

Gulbransen, D. J.; Fletcher, C. L.; Wyles, R. H.; Gin, A. E.; Curzan, J. P.; Aug. 1999; 9p; In English
Report No.(s): AD-A390473; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Until recently very large focal plane arrays (> 1K x 1K pixels) could only be fabricated using low density is greater than = 2 micrometers CMOS processes employing frill wafer projection lithography. Higher density processes use steppers to expose the patterns on the wafer which have limited the die size to the area able to be exposed in a single step. This placed an upper limit on the readout die size of about 18-22 millimeters along a side. While stitching techniques have been used to pattern larger die most silicon foundries are unwilling to accept such projects.

DTIC

Readout; Focal Plane Devices; Infrared Detectors

20010084649 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA

Low-Speed Pressure Measurements Using a Luminescent Coating system

Owen, Brown, Stanford Univ., USA; May 2000; 420p; In English; Original contains color illustrations
Contract(s)/Grant(s): NCC2-55

Report No.(s): JIAA-TR-123; Copyright; Avail: Issuing Activity

Luminescent Coating Measurement Systems are a unique, relatively new technology which provide the aerodynamicist with an excellent flow visualization tool and quantitative pressure measurement capability. Luminescent Coatings, typically referred to as Pressure Sensitive Paints (PSP), contain a sensor molecule, which when excited with UV light will undergo a luminescent reaction. The reaction is pressure sensitive, such that higher pressures result in decreased luminescence intensity. In this technique, PSP is applied to wind-tunnel models which are excited with ultraviolet lighting. When imaged with a scientific grade camera, surface pressures on the model can be extrapolated with very high fidelity. Because preparation time is short, PSP systems also offer a more economic alternative to conventional testing methods using large numbers of pressure taps. Relatively little testing has been conducted at low-speeds (Mach less than 0.2) using the PSP technique. In this flow regime, many noise sources can begin to overwhelm the PSP signal, potentially resulting in useless results. This is unfortunate, as many practical problems in fluid mechanics exist at low speeds. This thesis concentrates on the use of luminescent coating systems in this low speed regime. In this work, the history of the development of the PSP technique in both the USA and Russia is first discussed in detail. A review

of the various PSP tests conducted to date is given. A thorough discussion of the physics and chemistry of luminescent coatings is provided. The processes of converting intensity signals to digital data are described; image processing procedures used to remove noise sources and convert intensity data into pressure measurements are reviewed. A general uncertainty analysis of the technique is then conducted and discussed. In the first phase of the investigation, a baseline series of low-speed tests at M is less than 0.2 were conducted using unswept and swept NACA 0012 airfoils. The results of these tests reveal significant sources of noise. For the subsequent tests, these experimental processes were modified to reduce the observed noise components. These process improvements led to low-speed PSP results that are unmatched in the literature. Analyses were also conducted to identify optimized calibration techniques using pressure taps. A detailed uncertainty analysis is presented using both analytical and Monte Carlo simulation methods. This analysis confirms that the observed measurement errors are reasonable, and that if the in-situ technique is used, very good accuracies are realizable at low speeds. Using these improved testing techniques, further experiments were performed under identical parameters. Conclusions indicate that pressure measurements using luminescent coatings were made at low speeds with excellent accuracies.

Author (revised)

Pressure Sensitive Paints; Wind Tunnel Models; Aerodynamics; Flow Visualization; Fluid Mechanics; Pressure Measurement; Luminescence; Wind Tunnel Tests

20010084910 Queens Coll., Flushing, NY USA

Testing of a Commercial CCD Camera

Tulsee, Taran, Queens Coll., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 103-109; In English; See also 20010084895

Contract(s)/Grant(s): NCC5-98; NCC5-116; NCC5-228; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The results are presented of the examination and testing of a commercial CCD camera designed for use by amateur astronomers and university astronomy laboratory courses. The characteristics of the CCD chip are presented in graphical and tabular form. Individual and averaged bias frames are discussed. Dark frames were taken and counts are presented as a function of time. Flat field and other images were used to identify and locate bad pixel columns as well as pixels which vary significantly from the mean pixel sensitivity.

Author

Charge Coupled Devices; CCD Cameras; Tables (Data); Graphs (Charts)

20010084971 NASA Goddard Space Flight Center, Greenbelt, MD USA

Calibration of Gyros with Temperature Dependent Scale Factors

Belur, Sheela V., Computer Sciences Corp., USA; Harman, Richard, NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 163-173; In English; See also 20010084958

Contract(s)/Grant(s): GS-35F-4381-G; NASA Order S-43411-G; No Copyright; Avail: CASI; A03, Hardcopy

The general problem of gyro calibration can be stated as the estimation of the scale factors, misalignments, and drift-rate biases of the gyro using the on-orbit sensor measurements. These gyro parameters have been traditionally treated as temperature-independent in the operational flight dynamics ground systems at NASA Goddard Space Flight Center (GSFC), a scenario which has been successfully applied in the gyro calibration of a large number of missions. A significant departure from this is the Microwave Anisotropy Probe (MAP) mission where, due to the high thermal variations expected during the mission phase, it is necessary to model the scale factors as functions of temperature. This paper addresses the issue of gyro calibration for the MAP gyro model using a manufacturer-supplied model of the variation of scale factors with temperature. The problem is formulated as a least squares problem and solved using the Levenberg-Marquardt algorithm in the MATLAB(R) library function NLSQ. The algorithm was tested on simulated data with Gaussian noise for the quaternions as well as the gyro rates and was found to consistently converge close to the true values. Significant improvement in accuracy was noticed due to the estimation of the temperature-dependent scale factors as against constant scale factors.

Author

Calibrating; Gyroscopes; Temperature Dependence; Computerized Simulation

20010084972 Computer Sciences Corp., Lanham, MD USA

On-Orbit Calibration of Redundant Spacecraft Gyros by Optimal Reduction to Three Axes

Radomski, M. S., Computer Sciences Corp., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 175-185; In English; See also 20010084958

Contract(s)/Grant(s): GS-35F-4381G; NASA Order S-43411-G; No Copyright; Avail: CASI; A03, Hardcopy

The Aqua spacecraft will carry four single-axis gyros configured with three orthogonal axes and one skew axis. This redundancy presents a challenge for batch methods of on-orbit gyro calibration that use a spacecraft rotation model deterministically related to gyro data, in that sensor data can respond to at most three angular velocity components. When the number of gyros, N , is greater than 3, the $3 \times N$ matrix, G , that reduces the N gyro measurements to three body-frame angular-velocity components cannot be fully determined by such methods; there are many such matrices that produce essentially the same angular velocity history. In such a case, spacecraft operators require information about the $N \times 3$ gyro linear response matrix, R , that relates gyro outputs to the body-frame angular velocities causing them. This matrix provides sufficient information to determine multiple reduced-dimension G -matrices for use in case of failure or degradation of one or more gyros, as well as to determine an optimal $3 \times N$ G for the fully-functional configuration. A viable proposal is to apply a $3 \times N$ pre-filter matrix, F , to the N gyro outputs before carrying out a conventional gyro calibration procedure. The angular-velocity history emerging from conventional calibration may then be used as input data, together with the same gyro data that generated it, to fit the alignment, scale-factor, and bias parameters of each gyro axis in turn. A difficulty of such a proposal is the arbitrariness in the choice of F . Due to gyro noise, different pre-filter matrices produce different calibrations. This paper presents a method of choosing F that is based on optimizing gyro consistency in the limit of infinite weight on gyro data, as compared to sensor data. The choice of F is independent of a priori alignment and is based on the gyro data alone. The method is applicable to any N of three or more, but reduces to conventional batch-estimation methodologies when $N = 3$. Results of computational comparison among calibration simulations using various choices of F will be presented for the Aqua gyro configuration with $N = 4$.

Author

Calibrating; Gyroscopes; Spacecraft Control; Matrix Management

20010084976 NASA Goddard Space Flight Center, Greenbelt, MD USA

In-Space Calibration of a Gyro Quadruplet

Bar-Itzhack, Itzhack Y., NASA Goddard Space Flight Center, USA; Harman, Richard R., NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 229-247; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

This work presents a new approach to gyro calibration where, in addition to being used for computing attitude that is needed in the calibration process, the gyro outputs are also used as measurements in a Kalman filter. This work also presents an algorithm for calibrating a quadruplet rather than the customary triad gyro set. In particular, a new misalignment error model is derived for this case. The new calibration algorithm is applied to the EOS-AQUA satellite gyros. The effectiveness of the new algorithm is demonstrated through simulations.

Author

Algorithms; Calibrating; Attitude Gyros; Computerized Simulation

20010084977 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Nonlinear Spacecraft Attitude Controller and Observer with an Unknown Constant Gyro Bias and Gyro Noise

Deutschmann, Julie, NASA Goddard Space Flight Center, USA; Sanner, Robert M., Maryland Univ., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 249-257; In English; See also 20010084958; No Copyright; Avail: CASI; A02, Hardcopy

A nonlinear control scheme for attitude control of a spacecraft is combined with a nonlinear gyro bias observer for the case of constant gyro bias, in the presence of gyro noise. The observer bias estimates converge exponentially to a mean square bound determined by the standard deviation of the gyro noise. The resulting coupled, closed loop dynamics are proven to be globally stable, with asymptotic tracking which is also mean square bounded. A simulation of the proposed observer-controller design is given for a rigid spacecraft tracking a specified, time-varying attitude sequence to illustrate the theoretical claims.

Author

Satellite Orientation; Attitude Control; Bias; Attitude Gyros; Computerized Simulation

20010084983 NASA Goddard Space Flight Center, Greenbelt, MD USA

Maximum Torque and Momentum Envelopes for Reaction Wheel Arrays

Reynolds, R. G., Spectrum Astro, Inc., USA; Markley, F. Landis, NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 327-334; In English; See also 20010084958; No Copyright; Avail: CASI; A02, Hardcopy

Spacecraft reaction wheel maneuvers are limited by the maximum torque and/or angular momentum which the wheels can provide. For an n -wheel configuration, the torque or momentum envelope can be obtained by projecting the n -dimensional hypercube, representing the domain boundary of individual wheel torques or momenta, into three dimensional space via the $3 \times n$ matrix of wheel axes. In this paper, the properties of the projected hypercube are discussed, and algorithms are proposed for

determining this maximal torque or momentum envelope for general wheel configurations. Practical implementation strategies for specific wheel configurations are also considered.

Author

Algorithms; Angular Momentum; Hypercube Multiprocessors; Momentum; Torque

20010085366 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA

Spectral and Temporal Characterization of High-Temperature Events

Bagby, William F., Air Force Inst. of Tech., USA; Mar. 2001; 103p; In English

Report No.(s): AD-A392540; AFIT-GAP-ENP-01M-01; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

The remote observations of the temporal and spectral characteristics of the infrared (IR) emissions from exploding ordnance have been correlated with explosion conditions. A Bomem MR-154 Fourier Transform Interferometer with two detectors, InSb and HgCdTe, was used to record spectra in the 1.3 - 20 micrometers range. Data was collected at spectral resolutions of 16/cm and 4/cm, and temporal resolutions of 0.045 and 0.123 s, respectively. The data files range in size from 900 Kilobytes to several Megabytes. These are reduced to 2-dimensional representations of temporal features that are less than 100 Kilobytes. The data analysis indicates the possibility of characterizing event species through one or more derived temporal features. Each event data matrix contains three dimensions of information describing radiance as a function of frequency and time. The observed data is first corrected for atmospheric losses to convert apparent radiance to emitted radiance. The data is then adjusted to remove background radiance. Finally, the corrected data is fit to a Planckian distribution function to compute event temperature and fractional field of view. Temporal profiles of temperature and fractional field of view are created to describe each event. The temporal profiles of each explosive type are compared to other explosive types. Certain explosive types indicated an afterburn feature on their temperature profiles. The afterburn feature wasn't apparent on the temperature profiles of other types. Additionally, the temporal evolution of fractional field of view was unique for each explosive type.

DTIC

Spectroscopy; Explosions; Infrared Radiation; Temperature Profiles; Temporal Resolution; Fourier Transformation; Interferometers; Ordinance

20010085929 PAMAM-Human Factors Engineering (1989) Ltd., Hod Hasharon, Israel

Content Validity Requirements for Simulated Sensor Imagery Interim Report, 1 Jan. - 30 Sep. 2000

Brickner, Michael S.; Oettinger, Ayelet; Sep. 2000; 69p; In English

Contract(s)/Grant(s): F61775-99-W-E085; AF Proj. 7184

Report No.(s): AD-A392462; AFRL-HE-WP-TR-2001-0003; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The present study was designed to perform a survey of sensor imagery simulation capabilities and requirements, with emphasis on SAR (Synthetic Aperture Radar) and FLIR (Forward Looking Infrared) imagery. The study includes a literature search and review of sensor image quality attributes and of their effects on object recognition and target acquisition performance. Applications for simulated imagery have been identified and their features are described in the report. Qualitative/quantitative requirements for these applications have been derived in terms of image quality and image content. A set of criteria for the performance of pattern and object recognition and target acquisition tasks, with each type of simulated imagery (FLIR and SAR), has been developed. The proposed set of criteria for the evaluation of required simulation fidelity of various types and purposes was examined with the help of ten expert users of sensor imagery (subject matter experts - SMEs).

DTIC

Synthetic Aperture Radar; Infrared Imagery; Target Acquisition; Images; FLIR Detectors; Pattern Recognition; Simulation

20010085966 Arete Associates, Inc., Tucson, AZ USA

Streak Tube Imaging LIDAR (STIL) for 3-D Imaging of Terrestrial Targets

Redman, B. C.; Griffis, A. J.; Schibley, E. B.; Apr. 2000; 21p; In English; Original contains color plates

Report No.(s): AD-A392466; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Streak Tube Imaging LIDAR (STIL) is a patented active imaging system using a pulsed laser and a streak tube receiver to produce high resolution 3-D range and intensity imagery. The laser beam is diverged in the cross-track (azimuth) direction into a fan beam which is projected into the scene as a cross-track line. The backscattered light from the scene is imaged onto the streak tube's photocathode, and is time (range) resolved by electrostatically sweeping the resultant electron beam across the streak tube's phosphor screen to generate from each laser pulse a continuous intensity-range-azimuth image which is captured by a CCD array fiber optically coupled to the phosphor screen. A high resolution 3-D image of the scene is produced from multiple sequential frames formed by repetitively pulsing the laser in synchrony with the CCD frame rate as an airborne platform "push broom" scans or as a single-axis scanner on a ground-based platform scans the laser fan beam over the scene. The frames are registered using

data from an inertial measurement with (IMU) to compensate for platform motion. The system can also use GPS data with the 3-D data from the sensor for absolute geolocation of points in the scene. Ground based field tests were conducted with STIL operating at 128 range by 512 azimuth pixels over 12.6 degrees and 47.6 degrees azimuthal fields-of-view (FOV). Targets included a HMMWV, a C-130 transport plane, two range resolution panels, and a contrast resolution panel. Data was collected at ranges from 100 m to 1 km. Data from these tests demonstrating achievement of pixel limited image resolution and 6 inch range resolution are presented.

DTIC

Imaging Techniques; Radar Targets; Laser Arrays; Fiber Optics; Optical Radar; Photocathodes; Laser Beams

20010086582 Defence Science and Technology Organisation, Maritime Operations Div., Melbourne, Australia

Instruction Manual for Ultrasonic Noise Recording System

Readhead, Mark L., Defence Science and Technology Organisation, Australia; April 2001; 26p; In English; Original contains color illustrations

Report No.(s): DSTO-GD-0285; DODA-AR-011-857; Copyright; Avail: Issuing Activity

A portable system for recording ambient noise in the sea has been developed. It is suitable for ultrasonic frequencies and can digitise at a rate of up to 1 MHz. The hydrophone is attached to the end of a lightweight aluminium pole of 4.5 m extension, which can be dismantled into 1.5 m lengths for ease of transport. The hydrophone has an integral preamplifier which is powered by batteries. The analogue to digital conversion is performed in a box with similar dimensions to a laptop computer. It is powered by another similarly-sized box of rechargeable batteries. The process is controlled by and the data is stored on a laptop computer. Software has been written to display the spectra of the ambient noise. Instructions on the use of the hardware and software are provided.

Author

Noise Spectra; Recording Instruments; Ultrasonic Radiation; Underwater Acoustics; Spectrum Analysis; Hydrophones

20010088236 Colorado State Univ., Dept. of Atmospheric Science, Fort Collins, CO USA

FIRE III: Radiative Significance of Middle and Upper Tropospheric Clouds Final Report

Cox, Stephen K., Colorado State Univ., USA; Apr. 20, 1999; 4p; In English

Contract(s)/Grant(s): 95-221; CSU Proj. 5-31922; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

During the course of this grant, we have fabricated a micro-pulse lidar system. This system was patterned after a similar instrument developed at Goddard Space Flight Center. During the fabrication we were able to take advantage of several new developments in components and altered the basic design accordingly. In addition a new data acquisition/reduction/display software package was developed and integrated into the lidar package. At this point the lidar has undergone initial testing and shows significant promise. There are several improvements being considered to enhance the performance.

Author

Optical Radar; Radiometers; Troposphere; Clouds (Meteorology)

20010088374 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

The Palomar Testbed Interferometer

Colavita, M. M., Jet Propulsion Lab., California Inst. of Tech., USA; Wallace, J. K., Jet Propulsion Lab., California Inst. of Tech., USA; Hines, B. E., Jet Propulsion Lab., California Inst. of Tech., USA; Gursel, Y., Jet Propulsion Lab., California Inst. of Tech., USA; Malbet, F., Jet Propulsion Lab., California Inst. of Tech., USA; Palmer, D. L., Jet Propulsion Lab., California Inst. of Tech., USA; Pan, X. P., Observatoire de Grenoble, France; Shao, M., Jet Propulsion Lab., California Inst. of Tech., USA; Yu, J. W., Jet Propulsion Lab., California Inst. of Tech., USA; Boden, A. F., Jet Propulsion Lab., California Inst. of Tech., USA; Astrophysical Journal; Jan. 01, 1999; Volume 510, pp. 505-521; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Palomar Testbed Interferometer (PTI) is a long-baseline infrared interferometer located at Palomar Observatory, California. It was built as a testbed for interferometric techniques applicable to the Keck Interferometer. First fringes were obtained in 1995 July. PTI implements a dual-star architecture, tracking two stars simultaneously for phase referencing and narrow-angle astrometry. The three fixed 40 cm apertures can be combined pairwise to provide baselines to 110 m. The interferometer actively tracks the white-light fringe using an array detector at 2.2 microns and active delay lines with a range of +/-38 m. Laser metrology of the delay lines allows for servo control, and laser metrology of the complete optical path enables narrow-angle astrometric measurements. The instrument is highly automated, using a multiprocessing computer system for instrument control and sequencing.

Author

Astronomical Interferometry; Infrared Interferometers; Astrometry; Star Trackers; Astronomical Observatories

20010089366 Army Aeromedical Research Lab., Fort Rucker, AL USA

Final Phase One Evaluation of the Microvision, Inc. Aircrew Integrated Helmet System (AIHS) HGU-56P Scanning Laser Display Final Report

Harding, Thomas H.; Martin, John S.; Beasley, Howard H.; Rash, Clarence E.; Jun. 2001; 32p; In English

Contract(s)/Grant(s): Proj-30162787A879

Report No.(s): AD-A392525; USAARL-2001-06; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In support of the RAH-66 Comanche, Microvision, Inc., Seattle, Washington, has developed a prototype helmet mounted display (HMD) based on laser sources. This report is the second evaluation of the Microvision system. This system has been tested for both optical and visual performance. Tests include exit pupil size (shape and uniformity), field-of-view, luminance, contrast, contrast transfer function (CTF), modulation transfer function (MTF), color discrimination, and optical focus.

DTIC

Helmet Mounted Displays; Lasers; Visual Perception

36

LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also 76 Solid-State Physics.

20010084446 Army Aeromedical Research Lab., Fort Rucker, AL USA

Laser Issues for Army Aviation: Questions & Answers Final Report, Jan.-Jun. 2001

Rash, Clarence E.; Reynolds, Barbara S.; Hauser, Jim; Jun. 2001; 16p; In English

Report No.(s): AD-A392484; USAARL-2001-07; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On the modern battlefield, lasers are used primarily as rangefinders and target designators; however, in the past the high cost and technological sophistication of lasers have limited their fielding to national armies. Their large size and power requirements have further limited their presence on the battlefield. Within the past few years, however, technological advances have reduced significantly both the size and power requirements of lasers and costs have plummeted. Within the military, especially in aviation, lasers are a major potential threat. The aviator's most important source for gathering information is his/her eyes. Either through hostile intentions or through training accidents, the aviator's vision has been susceptible to damage through exposure to lasers. Today, this potential threat has increased significantly with the easy availability of low-cost laser pointers. The U.S. Army has long recognized the need to address the issues of lasers, laser protection and laser injuries. While a considerable amount of knowledge has been acquired over the years regarding lasers, this knowledge does not always reach the field. This report is an effort to answer commonly-fielded questions on lasers, laser protection and laser-related injuries.

DTIC

Lasers; Laser Applications; Protection

20010085331 Academy of Sciences (USSR), Laser Materials and Technology Research Center, Moscow, USSR

Color Center Mockup Development and Testing Final Report

Basiev, Tasoltan T.; Mar. 2001; 60p; In English

Contract(s)/Grant(s): SPC99-4061; F61775-99-WE

Report No.(s): AD-A392832; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report results from a contract tasking General Physics Institute as follows: The contractor will develop and test a narrow linewidth (500 MHz), tunable (1080 to 1350 nm) color center laser based on LiF and NaF crystals with a goal of being 10 to 20% efficient when pumped with a Nd:YAG or Nd:LaF3 laser.

DTIC

Color Centers; Neodymium Lasers; Tunable Lasers; YAG Lasers

20010086052 Norwegian Defence Research Establishment, Kjeller, Norway

Beam Shaping of High Power Laser Diode Bars

Rustad, Gunnar, Norwegian Defence Research Establishment, Norway; Lippert, Espen, Norwegian Defence Research Establishment, Norway; Stenersen, Knut, Norwegian Defence Research Establishment, Norway; May 15, 2001; 44p; In English; Original contains color illustrations

Contract(s)/Grant(s): FFIE Proj. 792/115

Report No.(s): FFI/RAPPORT-2001/02647; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A technique for reshaping the highly astigmatic beam from a high-power laser diode bar by use of two parallel mirrors is studied theoretically and experimentally. It is found that the output from the 1 micrometer x 1 cm laser diode can be reshaped and focused down to a spot of less than 0.5 mm diameter with reasonably good beam symmetry +/- 5 mm from the focal plane. Experimentally, it was found that -80% of the output power at the laser diode could be coupled into this spot. This is an efficient technique for laser-diode end-pumping of high-power solid-state lasers. Further, several diode parameters that affect the design of the beam shaping system are investigated, and two main operating regimes are identified. For diodes with a small number (about 20) of active regions, a geometry where the diode bar is imaged onto the mirrors should be used, whereas for diodes with a large number (about 50) of active regions, a nonimaging geometry can be used. The imaging geometry offers better output beam quality, while the non-imaging geometry offers greater flexibility and easier alignment.

Author

Semiconductor Diodes; High Power Lasers; Semiconductor Lasers; Beamforming; Beam Steering; Laser Beams

20010088239 Northrop Grumman Corp., Rolling Meadows, IL USA

OASYS Laser Radar Characterization of Natural and Manmade Terrestrial Features

Grasso, Robert J.; Stimson, Clinton G.; Vann, Christopher M.; Pratty, Adam C.; McDonald, Eleanor; Apr. 2000; 15p; In English; The original document contains color images. Prepared in cooperation with Defence Evaluation and Research Agency, Farnborough, UK.

Report No.(s): AD-A392392; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Performance of the Northrop Grumman Obstacle Avoidance Laser Radar System (OASYS) has been characterized against various terrestrial targets. OASYS is capable of discriminating and identifying objects from a complementary background as well as producing high-resolution laser radar imagery. Its primary function alerts pilots to obstacles in a helicopter flight path; thus allowing evasive maneuvers to be performed to avoid collision. Primary obstacles encountered are: 1) wires; 2) trees; 3) transmission towers; 4) vertical poles; 5) structures, and; 6) terrain. of these, wires are the most difficult to detect due to their small cross section. A simple, but very effective object identification algorithm is utilized which unerringly communicates large volumes of detected object data to the pilot, or to the recording computer for later analysis. In the program reported here, laser radar images of various terrestrial objects were obtained and their properties measured. In this manner a database of object signatures, cross-sections, and images is obtained. These objects include: 1) wires of various diameter and reflectivity; 2) trees and vegetation; 3) large and small vertical objects including transmission towers and poles; 4) buildings and structures, and 5) various terrain types.

DTIC

Obstacle Avoidance; Optical Radar; Lasers; Warning Systems; Images

37

MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 Cybernetics, Artificial Intelligence, and Robotics; and 54 Man/System Technology and Life Support.

20010083026 NASA Marshall Space Flight Center, Huntsville, AL USA

Friction Stir Welding of the Space Shuttle External Tank Longitudinal Barrel Welds

Adams, Glynn, Lockheed Martin Corp., USA; Pareti, Paul, Lockheed Martin Corp., USA; Thompson, Jack, General Tool Co., USA; Lawless, Kirby, NASA Marshall Space Flight Center, USA; [2001]; 18p; In English; AeroMat 2001, 11-14 Jun. 2001, Los Angeles, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Through the implementation of friction stir welding, the safety, reliability, and producibility of the external tank is enhanced. Such fusion procedures are accomplished with the use of a short barrel weld tool or a long barrel weld tool. Forecasted developments in the fusion tooling field include the advent of a universal tool which is capable to fusing all barrel configurations. A wide array of mechanical and electrical controls are described for such a device.

CASI

External Tanks; Friction Welding; Welded Joints

20010083997 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan

Relationship between Combustibility and Torque Harmonics in Internal Combustion Engines

Li, Wen-Zhe, Hokkaido Univ., Japan; Miyamoto, Noboru, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; February 1994; ISSN 0385-602X, No. 168, pp. 1-9; In Japanese; Copyright Waived; Avail: Issuing Activity

This paper investigates characteristics of torque harmonics related to combustibility and in-cylinder pressure variations in internal combustion engines. The result of the investigation indicated that lower frequency torque harmonics, below 2-orders of the engine revolution were governed mainly by the indicated mean effective pressure rather than by combustibility or the behavior of the combustion rates. Higher frequency torque harmonics, above 2.0 or 2.5 orders, were somewhat affected by combustibility and showed a stronger positive correlation to maximum cylinder pressures. However, the retardation of ignition timings and increases in combustion duration resulted in a slight increase in the lower frequency harmonics in spite of the small increased indicated mean effective pressures, and the decrease in the higher frequency harmonics.

Author

Internal Combustion Engines; Torque; Harmonics; Fuel Combustion

20010084713 Department of the Navy, Washington, DC USA

Compact Drive Shaft Floating Seal System

Amaral, Antonio M., Inventor; Aug. 28, 2000; 19p; In English

Patent Info.: Filed 20 Aug. 2000; US-Patent-Appl-SN-09,652,304

Report No.(s): AD-D019926; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A compact floating seal system for sealing a rotating shaft within a structure. The floating seal system has a cylindrical outer seal housing positioned within the structure with a cylindrical internal recessed region formed in the outer seal housing and a retaining flange extending into the internal recessed region. An axial retaining means axially retains the outer seal housing against the structure, and an outer torque member prevents rotation of the outer seal housing with respect to the structure. An inner seal housing is retained within the internal recessed region and abuts the retaining flange for preventing axial movement of the housing. The inner seal housing has a shaft aperture therethrough. First and second sealing member retaining grooves formed within the shaft aperture retain O-rings. A lubricant recess is formed within the shaft aperture between the grooves. A rotation prevention means allows radial deflection of the inner seal housing within the outer seal housing but prevents rotation of the inner seal housing with respect to the outer seal housing.

DTIC

O Ring Seals; Rotating Shafts; Apertures; Floating; Flanges

20010084790 NASA Marshall Space Flight Center, Huntsville, AL USA

Friction Stir Welding of Steel Alloys

Ding, R. Jeffrey, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; AeroMat Conference, 11-14 Jun. 2001, Long Beach, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The friction stir welding process has been developed primarily for the welding of aluminum alloys. Other higher melting allows such, as steels are much more difficult to join. Special attention must be given to pin tool material selection and welding techniques. This paper addresses the joining of steels and other high melting point materials using the friction stir welding process. Pin tool material and welding parameters will be presented. Mechanical properties of weldments will also be presented. Significance: There are many applications for the friction stir welding process other than low melting aluminum alloys. The FSW process can be expanded for use with high melting alloys in the pressure vessel, railroad and ship building industries.

Author

Friction Welding; Mechanical Properties; Aluminum Alloys; Steels

20010085340 NASA Ames Research Center, Moffett Field, CA USA

Evaluating Manufacturing and Assembly Errors in Rotating Machinery to Enhance Component Performance

Tumer, Irem Y., NASA Ames Research Center, USA; Huff, Edward M., Computational Sciences, USA; Jan. 23, 2001; 15p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Manufacturing and assembly phases play a crucial role in providing products that meet the strict functional specifications associated with rotating machinery components. The errors resulting during the manufacturing and assembly of such components are correlated with the vibration and noise emanating from the final system during its operational lifetime. Vibration and noise are especially unacceptable elements in high-risk systems such as helicopters, resulting in premature component degradation and an unsafe flying environment. In such applications, individual components often are subject to 100% inspection prior to assembly, as well as during operation through rigorous maintenance, resulting in increased product development cycles and high production

and operation costs. In this work, we focus on providing designers and manufacturing engineers with a technique to evaluate vibration modes and levels for each component or subsystem prior to putting them into operation. This paper presents a preliminary investigation of the correlation between vibrations and manufacturing and assembly errors using an experimental test rig, which simulates a simple bearing and shaft arrangement. A factorial design is used to study the effects of: 1) different manufacturing instances; 2) different assembly instances; and, 3) varying shaft speeds. The results indicate a correlation between manufacturing or assembly errors and vibrations measured from accelerometers. Challenges in developing a tool for DFM are identified, followed by a discussion of future work, including a real-world application to helicopter transmission vibrations.

Author

Component Reliability; Errors; Factorial Design; Helicopter Propeller Drive; Functional Design Specifications; Vibration; Shafts (Machine Elements)

20010088386 NASA Marshall Space Flight Center, Huntsville, AL USA

Modeling of Multi-Tube Pulse Detonation Engine Operation

Ebrahimi, Houshang B., Tennessee Univ., USA; Mohanraj, Rajendran, Tennessee Univ., USA; Merkle, Charles L., Tennessee Univ., USA; [2001]; 10p; In English, Jan. 2001, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA Report No.(s): AIAA Paper 2001-3813; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

The present paper explores some preliminary issues concerning the operational characteristics of multiple-tube pulsed detonation engines (PDEs). The study is based on a two-dimensional analysis of the first-pulse operation of two detonation tubes exhausting through a common nozzle. Computations are first performed to assess isolated tube behavior followed by results for multi-tube flow phenomena. The computations are based on an eight-species, finite-rate transient flow-field model. The results serve as an important precursor to understanding appropriate propellant fill procedures and shock wave propagation in multi-tube, multi-dimensional simulations. Differences in behavior between single and multi-tube PDE models are discussed. The influence of multi-tube geometry and the preferred times for injecting the fresh propellant mixture during multi-tube PDE operation are studied.

Author

Flow Distribution; Pulse Detonation Engines; Shock Wave Propagation; Computational Fluid Dynamics

39

STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

20010083646 Norwegian Defence Research Establishment, Kjeller, Norway

A Stochastic SPH Flaw Model and the Evolution of Fractures: Documentation of an Implementation as FORTRAN 90 Subroutines in Autodyn En Stokastisk SPH Defektmodell og Utvikling av Sprekker: Dokumentasjon av en Implementasjon som FORTRAN 90 Subrutiner i Autodyn

Soleng, Harald H., Norwegian Defence Research Establishment, Norway; Feb. 23, 2001; 66p; In English; Original contains color illustrations

Contract(s)/Grant(s): FFIBM Proj. 766

Report No.(s): FFI/RAPPORT-2001/01090; ISBN 82-464-0516-0; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We implement a statistical fracture model using the smooth particle hydrodynamics (SPH) processor of Autodyn-2D version 4.1.13. The model combines hydrodynamic tensile failure of the background with a stochastic flaw and fracture model. The code described by this document has been written in noweb. Both the computer code in FORTRAN 90 and Matematica as well as the LATEX source of this document are automatically generated from noweb source code files.

Author

Stochastic Processes; Computerized Simulation; Computer Programs; Mathematical Models; Defects; Failure Analysis; Fracture Mechanics; Fractures (Materials); Cracks

20010086235 NASA Glenn Research Center, Cleveland, OH USA

Stress Formulation in Three-Dimensional Elasticity

Patnaik, Surya N., Ohio Aerospace Inst., USA; Hopkins, Dale A., NASA Glenn Research Center, USA; September 2001; 26p; In English

Contract(s)/Grant(s): RTOP 505-63-5B

Report No.(s): NASA/TP-2001-210515; E-10106-1; NAS 1.60:210515; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The theory of elasticity evolved over centuries through the contributions of eminent scientists like Cauchy, Navier, Hooke Saint Venant, and others. It was deemed complete when Saint Venant provided the strain formulation in 1860. However, unlike Cauchy, who addressed equilibrium in the field and on the boundary, the strain formulation was confined only to the field. Saint Venant overlooked the compatibility on the boundary. Because of this deficiency, a direct stress formulation could not be developed. Stress with traditional methods must be recovered by backcalculation: differentiating either the displacement or the stress function. We have addressed the compatibility on the boundary. Augmentation of these conditions has completed the stress formulation in elasticity, opening up a way for a direct determination of stress without the intermediate step of calculating the displacement or the stress function. This Completed Beltrami-Michell Formulation (CBMF) can be specialized to derive the traditional methods, but the reverse is not possible. Elasticity solutions must be verified for the compliance of the new equation because the boundary compatibility conditions expressed in terms of displacement are not trivially satisfied. This paper presents the variational derivation of the stress formulation, illustrates the method, examines attributes and benefits, and outlines the future course of research.

Author

Michell Theorem; Mathematical Models; Boundary Conditions; Elastic Properties; Stress Analysis

20010086243 Sandia National Labs., Albuquerque, NM USA

Consistent Kinetics Porosity (CKP) Model: A Theory for the Mechanical Behavior of Moderately Porous Solids

Brannon, R. M.; Nov. 2000; 156p; In English

Report No.(s): DE2001-771502; SAND2000-2696; No Copyright; Avail: Department of Energy Information Bridge

This report describes a constitutive model for moderately porous solids. The model combines many conventional theories for porous materials into single self-consistent formulation, which is why we call it the 'Consistent Kinetics Porosity (CKP) model.' by consistent, we mean that each feature of the model is implemented in a manner that is mathematically compatible with the other features. The CKP model has been implemented and tested in a stand-alone deformation driver code (1) and in Sandia National Laboratories' parallel arbitrary Lagrangian-Eulerian finite element code, ALEGA (2,3). The numerical implementation follows the MIG model interface guidelines (4), making it ready for implementation in other host codes with minimal modifications. The body of this report focuses on the physical theory of the CKP model.

NTIS

Porous Materials; Porosity; Kinetics; Mathematical Models

20010089139 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

DTFM Modeling and Analysis Method for Gossamer Structures

Fang, Hou-Fei, Jet Propulsion Lab., California Inst. of Tech., USA; Lou, Michael, Jet Propulsion Lab., California Inst. of Tech., USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Gossamer systems are mostly composed of support structures formed by highly flexible, long tubular elements and pre-tensioned thin-film membranes. These systems offer order-of-magnitude reductions in mass and launch volume and will revolutionize the architecture and design of space flight systems that require large in-orbit configurations and apertures. A great interest has been generated in recent years to fly gossamer systems on near-term and future space missions. Modeling and analysis requirements for gossamer structures are unique. Simulation of in-space performance issues of gossamer structures, such as inflation deployment of flexible booms, formation and effects of wrinkle in tensioned membranes, synthesis of tubular and membrane elements into a complete structural system, usually cannot be accomplished by using the general-purpose finite-element structural analysis codes. This has led to the need of structural modeling and analysis capabilities specifically suitable for gossamer structures. The Distributed Transfer Function Method (DTFM) can potentially meet this urgent need. Additional information is contained in the original extended abstract.

Author

Membrane Structures; Computerized Simulation; Spacecraft Structures

20010089254 NASA Goddard Space Flight Center, Greenbelt, MD USA

Software Tools for Analysis of Bonded Joints

Tahmasebi, Farhad, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Linear and nonlinear springs have been used to model adhesives in bonded joints. This presentation describes two programs which obtain stresses and strains in bonded joints. For a given bonded joint model, these programs read the corresponding NASTRAN input and output files, use the spring forces or deformations to obtain the adhesive stresses or strain fields, sort the stresses and strains in descending order, and generate Mathematica plot files for three dimensional visualization of the stress and strain fields.

Author

Computerized Simulation; Bonded Joints; Springs (Elastic)

42

GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20010083467 Environmental Protection Agency, Region X, Seattle, WA USA

Feasibility for Identifying Mineralogical and Geochemical Tracers for Vermiculite Ore Deposits *Final Report*

Frank, D.; Edmond, L.; Feb. 2001; 52p; In English

Report No.(s): PB2001-106918; EPA/910/R-01/002; No Copyright; Avail: Issuing Activity

A review of the geological, industrial, and health literature on vermiculite ore deposits indicates that mineralogical or chemical fingerprints may exist that would allow linking vermiculite in consumer products to a particular source ore deposit. Two characteristics of vermiculite suggest that pursuit of a set of tracers could be successful. First, vermiculite deposits are formed in geochemically distinct, ultramafic environments that may concentrate a unique set of minor or trace elements. Second, vermiculite is a mineral with particularly high cation exchange capacity and is amenable to sequestering and retaining trace elements. A two-phase approach toward identifying suitable tracers is recommended. The first phase would include a screening study of a small set of samples from the few major sources that serve the U.S. market. The screening study would determine whether enough variation exists among ore deposits to yield measurable differences in diagnostic minerals or elements. The screening study would also evaluate whether diagnostic characteristics can be detected in a few selected vermiculite products.

NTIS

Mineralogy; Geochemistry; Trace Elements; Vermiculite; Mineral Deposits

20010083877 Texas Univ., Austin, TX USA

Integrated Outcrop and Subsurface Studies of the Interwell Environment of Carbonate Reservoirs: Clear Fork (Leonardian Age) Reservoirs, West Texas and New Mexico *Annual Report*

Lucia, F. J.; Ruppel, S. C.; May 2001; 34p; In English

Report No.(s): DE2001-774007; DOE/BC/15105-1; No Copyright; Avail: Department of Energy Information Bridge

The analysis of facies geometries in the Apache Canyon Clear Fork outcrop has been completed. In general, the facies and cycles are continuous on the scale of miles in the transgressive systems tracts. Cycle thicknesses are 5 to 10 ft. Cycle dimensions in the inner ramp and ramp crest are variable but are normally less than 2,000 ft long and 10 to 20 ft thick. Cycle thicknesses in the outer-ramp and tidal-flat facies range from 5 to 10 ft, and outer ramp cycles are highly continuous, whereas tidal-flat cycles are discontinuous on the scale of about 2,000 ft.

NTIS

Reservoirs; Outcrops; Carbonates

20010083953 Geological Survey, Water Resources Div., Miami, FL USA

Water Resources Data for Florida Water Year 2000, Volume 2A, South Florida Surface Water *Annual Report, 1 Oct. 1999 - 30 Sep. 2000*

Price, C.; Woolverton, J.; Overton, K.; May 15, 2001; 316p; In English

Report No.(s): PB2001-107583; USGS-WDR-FL-00-2A; No Copyright; Avail: Issuing Activity

Water resources data for water year in Florida consists of continuous or daily discharge for 355 streams, periodic discharge for 17 streams, continuous or daily stage for 211 streams, periodic stage for 1 stream, peak discharge for 37 streams, and peak stage for 37 streams, continuous or daily elevations for 16 lakes, periodic elevations for 45 lakes, continuous ground-water levels for 393 wells, periodic ground-water levels for 10003 wells, quality of water data for 124 surface-water sites, and 244 wells. The data for South Florida included continuous or daily discharge for 70 streams, continuous or daily stage for 134 streams, no peak stage discharge for streams, continuous elevations for 1 lake, continuous ground-water levels for 219 wells, periodic ground-water

levels for 229 wells, water quality for 30 surface-water sites, and 155 wells. The data represent the National Water Data System records collected by the U.S. Geological Survey and cooperation with local, state, and federal agencies in Florida.

NTIS

Geological Surveys; Water Resources; Water Quality; Data Systems; Hydrology; Chemical Analysis

20010084012 Geological Survey, Water Resources Div., Altamonte Springs, FL USA

Water Resources Data for Florida Water Year 2000, Volume 1A, Northeast Florida Surface Water Annual Report, 1 Oct. 1999 - 30 Sep. 2000

May 29, 2001; 414p; In English

Report No.(s): PB2001-107407; USGS/WDR-FL-00-1A; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

Water resources data for the 2000 water year in Florida consist of continuous or daily discharge for 355 streams, periodic discharge for 17 streams, continuous or daily stage for 211 streams, periodic stage for 1 stream, peak stage and discharge for 37 streams; continuous or daily elevations for 16 lakes, periodic elevations for 45 lakes; continuous ground-water levels for 393 wells, periodic ground-water levels for 1,003 wells; quality-of-water data for 124 surface-water sites and 244 wells. The data for northeast Florida include continuous or daily discharge for 145 streams, periodic discharge for 3 streams, continuous or daily stage for 21 streams, periodic stage for 0 streams; peak stage and discharge for 0 streams; continuous or daily elevations for 12 lakes, periodic elevations for 18 lakes; continuous ground water levels for 60 wells, periodic ground-water levels for 404 wells; quality-of-water data for 31 surface-water sites and 62 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida.

NTIS

Data Systems; Geological Surveys; Water Resources; Hydrology; Water Quality

20010084301 Geological Survey, Water Resources Div., Columbia, SC USA

Water Resources Data for South Carolina Water Year 2000 Annual Report, 1 Oct. 1999 - 30 Sep. 2000

Cooney, T. W.; Drewes, P. A.; Ellisor, S. W.; Melendez, F.; Jun. 2001; 670p; In English; Prepared in cooperation with the State of South Carolina

Report No.(s): PB2001-107646; USGS-WDR-SC-00-1; No Copyright; Avail: CASI; A06, Microfiche; A99, Hardcopy

Water Resources data for the 2000 water year for South Carolina consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and levels of ground-water wells. This volume contains records for water discharge at 120 gaging stations, stage only at 39 gaging stations, stage and contents at 15 lakes and reservoirs, water-quality at 38 gaging stations and at one observation well, and water levels at 46 observation wells. Also included are data for 52 crest-stage partial-record stations and discharge measurement information at 7 locations.

NTIS

Water Resources; Water Quality; South Carolina; Data Systems; Hydrology

20010084305 Geological Survey, Water Resources Div., Urbana, IL USA

Documentation and Verification of VST2D: A Model for Simulating Transient, Variably Saturated, Coupled Water-Heat-Solute Transport in Heterogeneous, Anisotropic, 2-Dimensional, Ground-Water Systems with Variable Fluid Density

Friedel, M. J., Geological Survey, USA; 2001; 148p; In English

Report No.(s): PB2001-106578; USGS/WRI-00-4105; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

The purpose of this report is to document and describe, and verify a numerical model for simulating transient, Variably Saturated, coupled water-heat-solute Transport in heterogeneous, anisotropic, 2-Dimensional (VST2D), ground-water systems with variable fluid density. to more effectively study natural and anthropogenic factors on coupled variably saturated subsurface transport phenomena, mathematical equations were developed to describe the simultaneous and coupled movement of mass (water and solute) and energy (heat). The ability to describe coupled transport phenomena in variably saturated ground-water systems is achieved through spatial discretization of pressure head, temperature, and chemical concentration for each equation. Next, these equations are transformed into a set of nonlinear algebraic equations using the Galerkin finite-element formulation to transform space derivatives, and the finite-difference method to discretize time. Various model properties, boundary conditions, and a nonlinear solution method are implemented to arrive at a numerical solution for which various problems are evaluated. Finally, a section on verification of the VST2D model is included for problems of water transport under isohaline and isothermal

conditions, heat transport under isobaric and isohaline conditions, solute transport under isobaric and isothermal conditions, and coupled water-heat-solute transport.

NTIS

Ground Water; Water Quality; Solutes; Man Environment Interactions; Water Temperature; Mathematical Models; Heterogeneity; Nonlinear Equations; Transport Properties

20010086951 Texas Univ., Bureau of Economic Geology, Austin, TX USA

Integrated Outcrop and Subsurface Studies of the Interwell Environment of Carbonate Reservoirs: Clear Fork (Leonardian Age) Reservoirs, West Texas and New Mexico (Rept. for Mar-Oct 2000) Annual Report, 31 Mar. - 1 Oct. 2000

Lucia, F. J.; Jennings, J. W.; May 2001; 24p; In English

Report No.(s): DE2001-780437; DOE/BC/15105-3; No Copyright; Avail: Department of Energy Information Bridge

A preliminary reservoir model has been constructed for the Lower Clear Fork of the South Wasson Clear Fork reservoir. The model was constructed by calibrating high frequency cycles observed in cores to the porosity log. Data from two limestone fields and one dolostone field are presented to support the contention that grain-dominated fabrics have higher porosity than mud-dominated fabrics do and that this difference is retained when the limestone is dolomitized. An ideal high-frequency cycle has been used to construct a detailed stochastic model using petrophysical data from the subsurface and outcrop.

NTIS

Outcrops; Reservoirs; Carbonates; Cycles

20010087011 Texas Univ., Bureau of Economic Geology, Austin, TX USA

Fossil Energy: Integrated Outcrop and Subsurface Studies of the Interwell Environment of Carbonate Reservoirs: Clear Fork (Leonardian Age) Reservoirs, West Texas and New Mexico (Rept. for Oct-Mar 2000) Annual Report, 1 Oct. 1999 - 31 Mar. 2000

Lucia, F. J.; Laubach, S. E.; May 2001; 14p; In English

Report No.(s): DE2001-780436; DOE/BC/5105; No Copyright; Avail: Department of Energy Information Bridge

The paper reports on progress achieved to date in the areas of fracture and reservoir modelling for the Clear Fork Reservoirs in West Texas and New Mexico.

NTIS

Fossils; Outcrops; Carbonates; Reservoirs

20010087776 Texas A&M Univ., Texas Transportation Inst., College Station, TX USA

Design Methods, Selection, and Cost-Effectiveness of Stormwater Quality Structures Topical Report, Sep. 1998 - Aug. 2000

Landphair, H. C.; McFalls, J. A.; Thompson, D.; Nov. 2000; 222p; In English

Contract(s)/Grant(s): Proj. 0-1837

Report No.(s): PB2001-107678; Rept-1837-1; FHWA/TX-01/1837-1; Copyright; Avail: Issuing Activity

Implementation of the National Pollutant Discharge Elimination System (NPDES) and Texas Pollutant Discharge Elimination System (TPDES) requires that the Texas Department of Transportation (TXDOT) adopt a variety of stormwater quality measures to meet Clean Water Act, Section 401 requirements. The permanent water quality structures that have been required in the Austin, Edwards Aquifer Zone are relatively expensive when compared to some other options. TXDOT wished to examine a variety of options for meeting stormwater quality requirements and to develop a cost comparison index that could be used to identify the most cost effective type of structure.

NTIS

Cost Effectiveness; Water Quality; Water Pollution

20010089134 Geological Survey, Water Resources Div., Louisville, KY USA

Water Resources Data for Kentucky Water Year 2000 Annual Report, 1 Oct. 1999 - 30 Sep. 2000

McClain, D. L.; Byrd, F. D.; Brown, A. C.; Apr. 03, 2001; 462p; In English; Prepared in cooperation with the Commonwealth of Kentucky

Report No.(s): PB2001-105373; USGS/WDR/KY-00/1; No Copyright; Avail: CASI; A04, Microfiche; A20, Hardcopy

Water resources data for the 2000 water year for Kentucky consist of records of stage, discharge, and water quality of streams and lakes; and water levels of wells. This report includes daily discharge records for 114 stream-gaging stations. It also includes water-quality data for eight stations sampled at regular intervals and continuous temperature at four stations. Ground-water levels are published for 6 recording and 23 partial-record sites. Precipitation data at a regular interval are published for one site. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as

miscellaneous measurements and analysis. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Kentucky.

NTIS

Geological Surveys; Data Systems; Water Resources; Kentucky; Data Acquisition; Water Quality; Hydrology

43

EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20010083027 Forest Service, Pacific Northwest Research Station, Portland, OR USA

Interpreting Landscape Change in High Mountains of Northeastern Oregon from Long-Term Repeat Photography

Skovlin, J. M.; Strickler, G. S.; Peterson, J. L.; Sampson, A. W.; May 2001; 89p; In English

Report No.(s): PB2001-107694; FSGTR-PNW-505; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The authors compared 45 photographs taken before 1925 to photographs taken as late as 1999 and documented landscape changes above 5,000 feet elevation in the Wallowa, Elkhorn, and Greenhorn Mountains of northeastern Oregon. The authors noted the following major changes from these comparisons: (1) the expansion of subalpine fir into mountain grasslands, (2) the invasion of moist and wet meadows by several tree species, (3) a loss of whitebark pine from subalpine habitats, (4) continued soil erosion stemming from livestock grazing long since discontinued, and (5) a high rate of natural gravitational mass wasting. The most important factor contributing to changes in woody vegetation has been a reduction in fire frequency. Fires that occurred before 1925 were nine times more frequent than those that occurred at the end of the 20th century. Historical land uses and origins of place names are described.

NTIS

Forest Management; Ecosystems; Grasslands; Habitats; Topography

20010084185 NASA Goddard Inst. for Space Studies, New York, NY USA

Remote Sensing of Global Wetland Dynamics with Multiple Satellite Data Sets

Prigent, Catherine, Observatoire de Paris, France; Matthews, Elaine, NASA Goddard Inst. for Space Studies, USA; Aires, Filipe, NASA Goddard Inst. for Space Studies, USA; Rossow, William B., NASA Goddard Inst. for Space Studies, USA; [2001]; 28p; In English

Report No.(s): GCN-01-28; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study is the first global effort to quantify seasonality and extent of inundation with a suite of satellite observations, including passive and active microwave along with visible and infrared measurements. A clustering technique which merges the satellite observations is used to detect inundation. Monthly flooded areas are then calculated by estimating pixel fractional coverage of flooding using the passive microwave signal and a linear mixture model with end-members calibrated with radar observations to account for vegetation cover. The global results, comprising natural wetlands, irrigated rice, and lakes/rivers, indicate a minimum inundated area for the July 1992-June 1993 period of 2.16×10^6 sq km, about 38% of the maximum 5.75×10^6 sq km, to be compared to maximum areas of 5.83×10^6 sq km and 5.7×10^6 sq km from independent data sets. Comprehensive evaluation requires substantial additions to the sparse observational record now available.

Author

Infrared Radiation; Microwaves; Radar Tracking; Remote Sensing; Satellite Observation; Wetlands; Water Management

20010085342 NASA Goddard Space Flight Center, Greenbelt, MD USA

Simple, Scalable, Script-Based Science Processor (S4P)

Lynnes, Christopher, NASA Goddard Space Flight Center, USA; Vollmer, Bruce, NASA Goddard Space Flight Center, USA; Berrick, Stephen, NASA Goddard Space Flight Center, USA; Mack, Robert, NASA Goddard Space Flight Center, USA; Pham, Long, NASA Goddard Space Flight Center, USA; Zhou, Bryan, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; International Geoscience and Remote Sensing Symposium, 9-13 Jul. 2001, Sydney, Australia; No Copyright; Avail: Issuing Activity; Abstract Only

The development and deployment of data processing systems to process Earth Observing System (EOS) data has proven to be costly and prone to technical and schedule risk. Integration of science algorithms into a robust operational system has been difficult. The core processing system, based on commercial tools, has demonstrated limitations at the rates needed to produce the

several terabytes per day for EOS, primarily due to job management overhead. This has motivated an evolution in the EOS Data Information System toward a more distributed one incorporating Science Investigator-led Processing Systems (SIPS). As part of this evolution, the Goddard Earth Sciences Distributed Active Archive Center (GES DAAC) has developed a simplified processing system to accommodate the increased load expected with the advent of reprocessing and launch of a second satellite. This system, the Simple, Scalable, Script-based Science Processor (S42) may also serve as a resource for future SIPS. The current EOSDIS Core System was designed to be general, resulting in a large, complex mix of commercial and custom software. In contrast, many simpler systems, such as the EROS Data Center AVHRR IKM system, rely on a simple directory structure to drive processing, with directories representing different stages of production. The system passes input data to a directory, and the output data is placed in a "downstream" directory. The GES DAAC's Simple Scalable Script-based Science Processing System is based on the latter concept, but with modifications to allow varied science algorithms and improve portability. It uses a factory assembly-line paradigm: when work orders arrive at a station, an executable is run, and output work orders are sent to downstream stations. The stations are implemented as UNIX directories, while work orders are simple ASCII files. The core S4P infrastructure consists of a Perl program called stationmaster, which detects newly arrived work orders and forks a job to run the appropriate executable (registered in a configuration file for that station). Although S4P is written in Perl, the executables associated with a station can be any program that can be run from the command line, i.e., non-interactively. An S4P instance is typically monitored using a simple Graphical User Interface. However, the reliance of S4P on UNIX files and directories also allows visibility into the state of stations and jobs using standard operating system commands, permitting remote monitor/control over low-bandwidth connections. S4P is being used as the foundation for several small- to medium-size systems for data mining, on-demand subsetting, processing of direct broadcast Moderate Resolution Imaging Spectroradiometer (MODIS) data, and Quick-Response MODIS processing. It has also been used to implement a large-scale system to process MODIS Level 1 and Level 2 Standard Products, which will ultimately process close to 2 TB/day.

Author

Earth Observing System (EOS); Earth Sciences; EOS Data and Information System; Remote Sensors

20010085932 Puerto Rico Univ., San Juan, Puerto Rico

Novel Electroceramic Materials and Integrated Devices *Final Report, 1 Sep. 1999 - 31 Aug. 2000*

Katihar, Ram S.; Aug. 2000; 18p; In English

Contract(s)/Grant(s): DAAD19-99-1-0362

Report No.(s): AD-A392491; ARO-39690.12-PH-SAH; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A number of Perovskites have been grown and their properties analyzed under the general field of 'Novel Electroceramic Materials and Integrated Devices'. Besides their structural properties, their electrical and optical properties were investigated. These investigations were published in ten papers that have appeared in scientific journals.

DTIC

Ceramics; Electrical Properties; Perovskites

20010087666 NASA Goddard Inst. for Space Studies, New York, NY USA

Carbon Storage in Wetlands and Lakes of the Eastern US

Renik, Byrdie, NASA Goddard Inst. for Space Studies, USA; Peteet, Dorothy, NASA Goddard Inst. for Space Studies, USA; [2001]; 1p; In English; American Geophysical Union Meeting, 29-31 May 2001, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Carbon stored underground may participate in a positive feedback with climate warming, as higher temperatures accelerate decomposition reactions and hence CO₂ release. Assessing how below-ground carbon storage varies with modern climate and paleoclimate will advance understanding of this feedback in two ways. First, it will estimate the sensitivity of carbon storage to temperature and precipitation changes. Second, it will help quantify the size of carbon stocks available for the feedback, by indicating how current regional climate differences affect carbon storage. Whereas many studies of below-ground carbon storage concentrate on soils, this investigation focuses on the saturated and primarily organic material stored in wetlands and lake sediments. This study surveys research done on organic sediment depth and organic content at 50-100 sites in the eastern U.S., integrating our own research with the work of others. Storage depth is evaluated for sediments from the past 10,000 years, a date reflected in pollen profiles. Organic content is measured chiefly by loss-on-ignition (LOI). These variables are compared to characteristics of the sites such as latitude, altitude, and vegetation as well as local climate. Preliminary results suggest a strong relationship between latitude and depth of organic material stored over the last 10,000 years, with more accumulation in the

northeastern US than the southeastern US. Linking the percent organic matter to actual carbon content is in progress with wetlands from Black Rock Forest and Alpine Swamp.

Author

Carbon; Chemical Composition; Atmospheric Temperature; Positive Feedback; Carbon Dioxide; Sediments

20010087782 NASA Goddard Inst. for Space Studies, New York, NY USA

Paleoenvironmental History of JoCo Marsh, Jamaica Bay, New York

Liberman, Louisa, NASA Goddard Inst. for Space Studies, USA; Peteet, Dorothy, NASA Goddard Inst. for Space Studies, USA; [2001]; 1p; In English; American Geophysical Union Meeting, 29-31 May 2001, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Sediment cores from JoCo Marsh, located in Jamaica Bay, NY were analyzed for plant macrofossil and foraminifera records. These records reflect changes in vegetation, sea level, climate and human intervention. Better understanding of past environmental changes provides information for future preservation and protection of the estuary. A 2.81 m core was retrieved from JoCo, a high marsh area located on the eastern side of Jamaica Bay. The lithology of the core differs from high levels of sand, with small amounts of clay, in the bottom 0.8 meters, to salt marsh peat in the upper 2 meters of the core. Basal wood in the sand was dated to about 2060 yr BP. Elphidium foraminifera dominate the basal sands, along with Scirpus seeds, wood, and charcoal. These sands include fish scales which are tentatively identified as killifish, suggesting shallow pools. The transition to marsh peat is dominated by sedge seeds, and declines in charcoal. The peat appears to be dominated by salt marsh grasses. At 2 m the foraminifera change to include mainly Trochammina species and other undifferentiated agglutinates. The upper portion of the core is dominated by Salicornia seeds along with Trochammina and Miliammina or Quinqueloculia. The history of this marsh will be integrated with other records of marsh environmental change along the US eastern seaboard.

Author

Sediments; Fossils; Vegetation; Marshlands; Lithology

20010088102 NASA Goddard Inst. for Space Studies, New York, NY USA

Hudson River Paleoclimate, Sea Level, and Human Impact: A Record From Piermont Marsh, NY

Kurdyla, NASA Goddard Inst. for Space Studies, USA; Peteet, Dorothy, NASA Goddard Inst. for Space Studies, USA; Liberman, Louisa, NASA Goddard Inst. for Space Studies, USA; Sugar, NASA Goddard Inst. for Space Studies, USA; Wong, NASA Goddard Inst. for Space Studies, USA; [2001]; 1p; In English; American Geophysical Union Meeting, 29-31 May 2001, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A 13.77 meter sediment core from Piermont Marsh, NY (40 00 N, 73 55W) records the local and regional vegetational and foraminiferal history of the Hudson Estuary. The sediments were sampled every 4 cm, which represents a decadal to centuryscale resolution. Basal sediment dating is in progress, and the 11-m depth represents about 4000 years. Changes in plant macrofossils and charcoal appear to indicate differences in salinity and drought, suggesting changes in climate. Scirpus, Salicornia, and high levels of charcoal seem to indicate drier/more saline conditions, while lack of these macrofossils and increases in Chara/Nitella, aquatic leaves, and very little charcoal suggests wetter conditions. Other macrofossils include Carex, Juncus, Polygonum, Zanichellia, Ruppia. High resolution AMS dating of plant macrofossils is in progress, and will be compared with changes in Hudson River sediment cores offshore. Foraminiferal assemblages from key intervals of the core will be presented. Human impact in the upper sediments is visible from the influx of grass seeds, primarily Phragmites, and the ragweed pollen rise.

Author

Sediments; Periodic Variations; Marshlands; Chronology; Fossils; Cores

20010088240 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Fault Detection and Model Identification in Linear Dynamical Systems

Horton, Kirk G.; Feb. 2001; 181p; In English

Report No.(s): AD-A392441; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Linear dynamical systems, $E\dot{x} + Fx = f(t)$, in which E is singular, are useful in a wide variety of applications. Because of this wide spread applicability, much research has been done recently to develop theory for the design of linear dynamical systems. A key aspect of system design is fault detection and isolation (FDI). One avenue of FDI is via the multi-model approach, in which the parameters of the nominal, unfailed model of the system are known, as well as the parameters of one or more fault models. The design goal is to obtain an indicator for when a fault has occurred, and, when more than one type is possible, which type of fault it is. A choice that must be made in the system design is how to model noise. One way is as a bounded energy signal. This approach places very few restrictions on the types of noisy systems which can be addressed, requiring no complex modeling requirement. This thesis applies the multi-model approach to FDI in linear dynamical systems, modeling noise as bounded energy

signals. A complete algorithm is developed, requiring very little on-line computation, with which nearly perfect fault detection and isolation over a finite horizon is attained. The algorithm applies techniques to convert complex system relationships into necessary and sufficient conditions for the solutions to optimal control problems. The first such problem provides the fault indicator via the minimum energy detection signal, while the second problem provides for fault isolation via the separating hyperplane. The algorithm is implemented and tested on a suite of examples in commercial optimization software. The algorithm is shown to have promise in nonlinear problems, time varying problems, and certain types of linear problems for which existing theory is not suitable.

DTIC

Complex Systems; Systems Engineering; Fault Detection; Isolation

20010088361 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA

Earth Observing-1 Advanced Land Imager: Dark Current and Noise Characterization and Anomalous Detectors

Mendenhall, J. A.; May 07, 2001; 86p; In English; Original contains color illustrations

Contract(s)/Grant(s): F19628-00-C-0002

Report No.(s): PB2001-105706; MIT-EO-1-5; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The dark current and noise characteristics of the Earth Observing-1 Advanced Land Imager measured during ground calibration at MIT Lincoln Laboratory are presented. Data were collected for the nominal focal plane operating temperature of 220 K as well as supplemental operating temperatures (215 and 225 K). Dark current baseline values are provided, and noise characterization includes the evaluation of white, coherent, low frequency, and high frequency components. Finally, anomalous detectors, characterized by unusual dark current, noise, gain, or cross-talk properties are investigated.

NTIS

Remote Sensing; Dark Current; Noise Measurement; LANDSAT Satellites

20010089151 Colorado Univ., Colorado Inst. for Research in Environmental Science, Boulder, CO USA

Sensing, Spectra and Scaling: What's in Store for Land Observations

Goetz, Alexander F. H., Colorado Univ., USA; [2001], pp. 55-59; In English; Proceedings Pecora XII Symposium: Land Information from Space-based Systems, 24-26 Aug. 1993, Sioux Falls, SD, USA

Contract(s)/Grant(s): NAS5-31711; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Bill Pecora's 1960's vision of the future, using spacecraft-based sensors for mapping the environment and exploring for resources, is being implemented today. New technology has produced better sensors in space such as the LANDSAT Thematic Mapper (TM) and SPOT, and creative researchers are continuing to find new applications. However, with existing sensors, and those intended for launch in this century, the potential for extracting information from the land surface is far from being exploited. The most recent technology development is imaging spectrometry, the acquisition of images in hundreds of contiguous spectral bands, such that for any pixel a complete reflectance spectrum can be acquired. Experience with Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) has shown that, with proper attention paid to absolute calibration, it is possible to acquire apparent surface reflectance to 5% accuracy without any ground-based measurement. The data reduction incorporates an educated guess of the aerosol scattering, development of a precipitable water vapor map from the data and mapping of cirrus clouds in the 1.38 micrometer band. This is not possible with TM. The pixel size in images of the earth plays an important role in the type and quality of information that can be derived. Less understood is the coupling between spatial and spectral resolution in a sensor. Recent work has shown that in processing the data to derive the relative abundance of materials in a pixel, also known as unmixing, the pixel size is an important parameter. A variance in the relative abundance of materials among the pixels is necessary to be able to derive the endmembers or pure material constituent spectra. In most cases, the 1 km pixel size for the Earth Observing System Moderate Resolution Imaging Spectroradiometer (MODIS) instrument is too large to meet the variance criterion. A pointable high spatial and spectral resolution imaging spectrometer in orbit will be necessary to make the major next step in our understanding of the solid earth surface and its changing face.

Author

Imaging Techniques; Satellite Observation; Remote Sensing; Imaging Spectrometers

20010089310 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

Evaluation of a Planet Physiological Canopy Conductance Model in the ECMWF Land Surface Scheme

vandeKasstele, J., Wageningen Univ., Netherlands; 2001; ISSN 0169-1708; 60p; In English; Original contains color illustrations
Report No.(s): KNMI-TR-234; ISBN 90-369-2195-3; Copyright; Avail: Issuing Activity

A new representation of the canopy conductance in large scale atmospheric models, based on plant physiological theory, is evaluated. Calibration parameters for this canopy conductance model are considered to be more universal than the coefficients

in the empirical relations used in many current large scale models. The new conductance model is compared with an empirical so-called Jarvis-Stewart approach in the European Center for Medium Range Weather Forecasting (ECMWF) land surface scheme. A priori settings of model parameters were used for all vegetation types except for needle-leaf forests, for which model parameters have been tuned using field observations. The behavior under different environmental conditions is examined. It is concluded that in the new model synergetic relations exist between the environmental variables, which are not present in the empirical approach. The new model is implemented in the ECMWF land surface scheme, It is tested in offline mode with data from five surface field campaigns with different surface characteristics and vegetation types. In general the mean error and scatter have become smaller. The best results were obtained for low vegetation surfaces. Furthermore the new plant physiological approach is tested in the 3D Regional Atmospheric Climate Model (RACMO) where it is compared with the empirical Jarvis-Stewart approach. One important aspect is that the evaporation has increased. Three subdomains were analysed separately, representing areas dominated by low vegetation, high vegetation, and needle-leaf forests. Comparing the modelled 2m relative humidity and temperature with observations for these areas it is concluded that the bias has become larger, but the root mean square error has become smaller in the new approach. Again the best results were obtained for low vegetation surfaces.

Author

Earth Surface; Atmospheric Models; Thermal Conductivity; Canopies (Vegetation); Surface Energy

44

ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

20010083604 NASA Marshall Space Flight Center, Huntsville, AL USA

The 2000 NASA Aerospace Battery Workshop

Brewer, J. C., Compiler, NASA Marshall Space Flight Center, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 773p; In English; The 2000 NASA Aerospace Battery Workshop, 14-16 November, 2000, Huntsville, AL, USA; See also 20010083605 through 20010083633; CD-ROM contains the entire Conference Proceedings presented in PDF format Report No.(s): NASA/CP-2001-210883; M-1009; NAS 1.55:210883; No Copyright; Avail: CASI; C01, CD-ROM

This document contains the proceedings of the 33rd annual NASA Aerospace Battery Workshop, hosted by the Marshall Space Flight Center on November 14-16, 2000. The workshop was attended by scientists and engineers from various agencies of the U.S. Government, aerospace contractors, and battery manufacturers, as well as international participation in like kind from a number of countries around the world. The subjects covered included nickel-hydrogen, lithium-ion, lithium-sulfur, and silver-zinc technologies.

Author

Electric Batteries; Storage Batteries; Spacecraft Power Supplies; Conferences

20010083606 Moltech Corp., USA

Advances in Lithium-Sulfur Rechargeable Batteries Powering the Electronic Future

Skotheim, Terje, Moltech Corp., USA; Akridge, Jim, Moltech Corp., USA; Hyland, Bob, Moltech Corp., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 28p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation discusses the Moltech Corporation's history and structure, power systems development, product attributes, Li-S adapted products, cell construction, specific energy comparisons, and product requirements necessary for use in spacecraft applications.

Derived from text

Lithium Sulfur Batteries; Spacecraft Power Supplies

20010083607 NASA Goddard Space Flight Center, Greenbelt, MD USA

Effects of AEA Cell-Bypass-Switch Closure on Charged EOS-Aqua NiH₂ Cell

Keys, Denney, NASA Goddard Space Flight Center, USA; Rao, Gopalakrishna M., NASA Goddard Space Flight Center, USA; Sullivan, David, NASA Goddard Space Flight Center, USA; Wannemacher, Harry, QSS Group, Inc., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 24p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

The nominal performance of AEA CBPD under simulated EOS-Aqua/Aura flight hardware configuration has been demonstrated. There is no evidence of cell rupture or excessive heat production during or after CBPD switch activation under simulated high cell impedance (open-circuit cell failure mode). Inadvertent CBPD switch activation with a charged cell (low impedance path) intermittently closes and opens up the switch, therefore the device may or may not provide protection against future open-circuit cell failure. Further testing with switches F01 and F02 may provide clarification. The formation of a continuous low impedance path (a homogeneous low melting point alloy), has been confirmed - which is the expected mode of operation.

Derived from text

Nickel Hydrogen Batteries; Electric Switches; Circuit Protection

20010083611 Aerospace Corp., Electronics and Photonics Lab., El Segundo, CA USA

Thermal and Cycle-Life Behavior of Commercial Li-ion and Li-Polymer Cells

Zimmerman, Albert H., Aerospace Corp., USA; Quinzio, M. V., Aerospace Corp., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 10p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A02, Hardcopy

Accelerated and real-time LEO cycle-life test data will be presented for a range of commercial Li-ion and Li-polymer (gel type) cells indicating the ranges of performance that can be obtained, and the performance screening tests that must be done to assure long life. The data show large performance variability between cells, as well as a highly variable degradation signature during non-cycling periods within the life tests. High-resolution Dynamic Calorimetry data will be presented showing the complex series of reactions occurring within these Li cells as they are cycled. Data will also be presented for cells being tested using an Adaptive Charge Control Algorithm (ACCA) that continuously adapts itself to changes in cell performance, operation, or environment to both find and maintain the optimum recharge over life. The ACCA has been used to prevent all unneeded overcharge for Li cells, NiCd cells and NiH₂ cells. While this is important for all these cell types, it is most critical for Li-ion cells, which are not designed with electrochemical tolerance for overcharge.

Author

Lithium Batteries; Thermal Cycling Tests; Service Life; Performance Tests

20010083613 TRW Space and Electronics Group, Redondo Beach, CA USA

Characterization and Simulated LEO Cycling of SAFT Lithium Ion Cells

Lurie, Chuck, TRW Space and Electronics Group, USA; Johnson, Philip, TRW Space and Electronics Group, USA; Staniewicz, Robert J., SAFT America, Inc., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 24p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This presentation summarizes test results, to date, obtained with SAFT MP commercial cells and prototype space cells. These tests are part of an ongoing program at TRW to evaluate lithium ion cells for space application. To facilitate development of a coherent data base, all cells in the program are subjected to similar test regimes: 1) Characterization - Charge acceptance as a function of CVL and temperature, Cell resistance as a function of SOC and temperature; 2) Cycling - LEO: 25% DOD, 15 C and 25 C, or GEO: 70% DOD, 15 C and 25 C.

Derived from text

Lithium Batteries; Performance Tests; Spacecraft Power Supplies

20010083614 Societe des Accumulateurs Fixes et de Traction, Defense and Space Div., Poitiers, France

Geo and Leo Life Test Results on VES140 SAFT Li-Ion

Borthomieu, Y., Societe des Accumulateurs Fixes et de Traction, France; Planchat, J. P., Societe des Accumulateurs Fixes et de Traction, France; The 2000 NASA Aerospace Battery Workshop; March 2001; 36p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation discusses the VES140 cell design, its qualification status, the calendar effect status, and life test results. Conclusions include ESA, CNES, ASTRIUM, and ASPI qualification, a calendar effect power law, a cycling law, negative excess and self discharge figures, and impedance air transportation authorization and industrial line capabilities.

CASI

Lithium Batteries; Spacecraft Power Supplies; Performance Tests; Charge Efficiency

20010083616 NASA Goddard Space Flight Center, Greenbelt, MD USA

Crane Cell Testing Support of NASA/Goddard Space Flight Center: An Update

Strawn, Mike, Naval Surface Warfare Center, USA; David, Jerry, Naval Surface Warfare Center, USA; Rao, Gopalakrishna M.,

NASA Goddard Space Flight Center, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 39p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

The objectives presented in this viewgraph presentation include: 1) Verify the quality and reliability of aerospace battery cells and batteries for NASA flight programs; 2) Disseminate the data to develop a plan for in-orbit battery management and to design a cell/battery for future NASA spacecraft; and 3) Establish a cell test data base for rechargeable cell/batteries. In summary: quality EPT Ni-H₂, EPT Super NiCd and SAFT NiCd cells have been demonstrated for aerospace applications; the data has been provided to NASA Centers and other agencies for their use and application; developed plan and used in NASA in-orbit battery management. Database on rechargeable cell/batteries is now available for customer use.

Derived from text

Electric Batteries; Performance Tests; Spacecraft Power Supplies; Nickel Cadmium Batteries

20010083617 Eagle-Picher Industries, Inc., Joplin, MO USA

Large Capacity Single Large Capacity Single Pressure Vessel (SPV) Battery Development

Dermott, Jack, Eagle-Picher Industries, Inc., USA; Brill, Jack, Eagle-Picher Industries, Inc., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 20p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

Two battery designs are being developed in the 13 inch diameter. Both designs utilize the basic technology qualified and flown on the Iridium program. 80 Ah design is being completed for qualification test with planned completion of March 2001. 120 Ah design will be completed by November 2001. These topics summarize the viewgraph presentation.

Derived from text

Electric Batteries; Performance Tests; Pressure Vessels; Spacecraft Power Supplies

20010083618 NASA Goddard Space Flight Center, Greenbelt, MD USA

Effect of Handling, Storage and Cycling on Ni-H₂ Cells: Second Plateau Phenomenon

Vaidyanathan, Hari, Lockheed Martin Telecommunications, USA; Rao, Gopalakrishna, NASA Goddard Space Flight Center, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 15p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

Proper handling of Ni-H₂ cells/batteries in storage, during I&T, and at launch site is very important to preserve the useful energy and to extend the mission life. Cell reversal test is not a prudent test to verify or quantify the nickel pre-charge in Ni-H₂ cells/batteries. The second plateau is due to the formation of Ni(+3) that is electrochemically inactive. Gas analysis of the cell, and chemical analysis of the positive plate are confirmatory tests to determine the nature of pre-charge in Ni-H₂ cells.

Derived from text

Nickel Hydrogen Batteries; Service Life; Spacecraft Power Supplies

20010083620 Eagle-Picher Industries, Inc., USA

Progress Toward a Li-ion Spacecraft Battery

Kelly, Chad, Eagle-Picher Industries, Inc., USA; DeGruson, James, Eagle-Picher Industries, Inc., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 50p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation presents supporting information leading to the following conclusions: 1) chemistry changes have shown significant increases in energy density/specific energy, rate/temperature capability, and service life; 2) GEO battery cycled over 2.5 years without individual cell control or bypass electronics; and 3) acceptable performance demonstrated during safety testing.

CASI

Lithium Batteries; Spacecraft Power Supplies; Charge Efficiency

20010083622 National Space Development Agency, Battery Group, Tsukuba, Japan

R&D Status of Li-Ion Secondary Cells at Tsukuba Space Center, NASDA

Sone, Y., National Space Development Agency, Japan; Liu, X., National Space Development Agency, Japan; Kusawake, H., National Space Development Agency, Japan; Kanno, K., National Space Development Agency, Japan; Kuwajima, S., National Space Development Agency, Japan; The 2000 NASA Aerospace Battery Workshop; March 2001; 30p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

Life cycle performance of large size Li-Ion secondary cells is studied at Tsukuba Space Center, NASDA. Ten Ah LiCoO₂/Graphite Cell LEO simulating test reveals stable cycle performance of the cells with series connection. We have already tested more than 6,000 life cycles in DOD=25/40% test. Thirty Ah LiCoO₂/Graphite Cell. More than 9,000 cycles have passed in DOD=25/40% LEO cycle test. The performance of cells have been very stable in the case of DOD=25%, while a considerable decrease in EODV and residual capacity was observed in the case of DOD=40%. In order to understand the degradation of DOD=40% samples, we performed destructive physical analysis. The analysis suggested us that the degradation of negative electrode played an important role in the degradation of cell performance. Based on these results, accompanied with the experience of 100Ah elliptic cylinder cells, we have started the discussion of the new trial cell which might enable high rate charge targeting LEO applications. In One hundred Ah LiCoO₂/Graphite Cells more or less than 5,000 cycles have passed in DOD=25/40% LEO cycle test, and more than 300 cycles have passed in DOD=80% GEO cycle test. No significant degradation of the performance has been observed, yet. Thermal effect on capacity was also presented. Ninety Ah LiMn₂O₄/Non-Graphite Cell. The study of this type of cells has just started. More than 1,000 cycles in DOD=40% LEO test and 45 cycles in DOD=80% GEO test have passed. Thermal effect on capacity was also presented.

Derived from text

Lithium Batteries; Service Life; Spacecraft Power Supplies

20010083624 NASA Johnson Space Center, Houston, TX USA

Li-ion EMU Battery Testing

Rehm, Raymond, Lockheed Martin Space Operations, USA; Bragg, Bobby, NASA Johnson Space Center, USA; Strangways, Brad, Symmetry Resources, Inc., USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 12p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

A 45Ah Lithium ion (Li-Ion) battery comprised of 5 Yardney prismatic cells was evaluated to replace the silver-zinc cells in the Extra-vehicular Mobility Unit (EMU). Tests determined that the five cell battery can meet the mission objective of 500 duty cycles and maintain a minimum voltage of 16.0 V without an individual cell voltage dropping below 3.0V. Forty real time cycles were conducted to develop BOL trend data. Decision to switch to accelerated cycling for the remaining 460 cycles was made since Real Time cycling requires 1 day/cycle. Conclusions indicate that battery replacement would indeed be prudent.

Author (revised)

Electrolytic Cells; Lithium Batteries; Silver Zinc Batteries; Electric Potential; Extravehicular Mobility Units; Performance Tests

20010083625 Schlumberger Technologies Corp., Billerica, MA USA

Performance and Abuse Testing of 5 Year Old Low Rate and Medium Rate Lithium Thionyl Chloride Cells

Frerker, Rick, Schlumberger Technologies Corp., USA; Zhang, Wenlin, Schlumberger Technologies Corp., USA; Jeevarajan, Judith, Lockheed Martin Space Operations, USA; Bragg, Bobby J., NASA Johnson Space Center, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 33p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format

Contract(s)/Grant(s): NASA/T-4551W; No Copyright; Avail: CASI; A03, Hardcopy

Most cells survived the 3 amp (A) over-discharge at room temperature for 2 hours. The cell that failed was the LTC-114 after high rate discharge of 500 mA similar to the results of the 1 A over-discharge test. Most cells opened during 0.05 Ohm short circuit test without incident but three LTC-111 cells exploded apparently due to a lack of a thermal cutoff switch. The LTC-114 cells exposed to a hard short of 0.05 Ohms recovered but the LTC-114 cells exposed to a soft short of 1 Ohm did not. This is probably due to the activation of a resettable fuse during a hard short. Fresh cells tend to survive exposure to higher temperatures than cells previously discharged at high rate (1 Amp). LTC-111 cells tend to vent at lower temperatures than the all LTC-114 cells and the LTC-115 cells that were previously discharged at rates exceeding 1 Amp.

Author

Lithium Batteries; Electrochemical Cells

20010083626 COM DEV Ltd., Cambridge, Ontario Canada

Lithium-Ion Satellite Batteries Using Small Cells

Lizius, David, COM DEV Ltd., Canada; Cowles, Phil, COM DEV Ltd., Canada; Spurrett, Rob, AEA Technology, UK; Thwaite, Carl, AEA Technology, UK; The 2000 NASA Aerospace Battery Workshop; March 2001; 25p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation explores whether the use of small lithium ion (Li-Ion) cells in Li-Ion batteries is preferable over the use of large cells. Details are discussed on the differences between the two possibilities. There are indications that small cells such as Sony 18650 HC cells can be used to build large batteries which could feasibly deliver higher performance.

CASI

Lithium Batteries; Service Life; Performance Tests

20010083627 TRW Space and Electronics Group, Redondo Beach, CA USA

Simulated LEO Cycling of AEA-STRV Lithium-Ion Battery Modules

Spurrett, R., AEA Technology, UK; Johnson, Philip, TRW Space and Electronics Group, USA; Lurie, Chuck, TRW Space and Electronics Group, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 16p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

Lithium-ion battery modules, similar to the modules to be flown on the Space Technology Research Vehicle (STRV), have been on test for almost two years. The modules, designed and assembled by AEA Technology plc, each contain twelve Sony 26650 cells. Characterization testing and LEO cycling through 2700 25% DOD cycles were reported at this workshop last year. This presentation summarizes the results of the simulated LEO cycling to date.

Author

Lithium Batteries; Performance Tests

20010083628 Army Communications-Electronics Command, Fort Monmouth, NJ USA

Lithium Ion Battery Design and Safety

Au, George, Army Communications-Electronics Command, USA; Locke, Laura, Army Communications-Electronics Command, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 31p; In English; See also 20010083604; Sponsored in part by Maxell, Inc. and E-One Moli Energy Ltd.; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation makes several recommendations to ensure the safe and effective design of Lithium ion cell batteries. Large lithium ion cells require pressure switches and small cells require pressure disconnects and other safety devices with the ability to instantly interrupt flow. Other suggestions include specifications for batteries and battery chargers.

CASI

Lithium Batteries; Safety

20010083629 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Performance and Safety of Lithium Ion Cells

Ratnakumar, B. V., Jet Propulsion Lab., California Inst. of Tech., USA; Smart, M. C., Jet Propulsion Lab., California Inst. of Tech., USA; Whitcanack, L., Jet Propulsion Lab., California Inst. of Tech., USA; Surampudi, S., Jet Propulsion Lab., California Inst. of Tech., USA; Marsh, R., Department of the Air Force, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 28p; In English; See also 20010083604; No Copyright; Avail: CASI; A03, Hardcopy

This report evaluates the performance and safety of Lithium Ion (Li-Ion) cells when used in batteries. Issues discussed include the cycle life, energy efficiency, tolerance to higher charge voltage, tolerance to extended tapered charge voltage, charge on cycling, specific energy, low temperature discharge, low temperature charge, various charge characteristics, storage characteristics, and more of Li-Ion cells.

CASI

Lithium Batteries; Electrolytic Cells; Performance Tests

20010083631 Litech, LLC, Tucson, AZ USA

Lithium-ion Battery Technology Configured to Tolerate Overcharge and Overdischarge

Hossain, S., Litech, LLC, USA; Saleh, Y., Litech, LLC, USA; Loutfy, R., Litech, LLC, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 21p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

There are shortfalls of present lithium-ion battery technology for the production of high capacity, high voltage batteries. The use of C-C as an anode may lead to an increased ability to accept repeated overdischarge. The batteries produced by LiTech LLC are valuable due to their low cost, enhanced safety, high energy density, long life, and low self-discharge.

Derived from text

Lithium Batteries; Charge Efficiency; Anodes

20010083632 AEA Technology, Abingdon, UK

Secondary Lithium-ion Cell and Battery Safety

Spurrett, Rob, AEA Technology, UK; Thwaite, Carl, AEA Technology, UK; Cowles, Philip, COM DEV Ltd., Canada; The 2000 NASA Aerospace Battery Workshop; March 2001; 31p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

AEA Technology and COM DEV teamed to build Lithium-Ion (Li-Ion) batteries based on the Sony 18650HC (hard-carbon) cell which is widely regarded as the safest cell. This paper describes: 1) safety features built into the Sony 18650HC cell, 2) formal safety approval tests performed on the cell, 3) safety tests performed as part of the lot acceptance test (LAT), 4) supplementary test data from on-going programmes.

Derived from text

Lithium Batteries; Electrolytic Cells; Storage Batteries

20010083633 Eagle-Picher Technologies, LLC, Joplin, MO USA

Safety & Abusive Tests on Different Li-Ion Systems

DeGruson, James, Eagle-Picher Technologies, LLC, USA; Kelly, Chad, Eagle-Picher Technologies, LLC, USA; The 2000 NASA Aerospace Battery Workshop; March 2001; 27p; In English; See also 20010083604; CD-ROM contains the entire Conference Proceedings presented in PDF format; No Copyright; Avail: CASI; A03, Hardcopy

Eagle Picher Technologies, LLC performed a number of tests on their SLC-16002 Lithium Ion Rechargeable cell battery. Design features of the battery include stainless steel containment, burst disc diaphragm, polymeric terminal seals, LiPF₆ electrolyte, CELGARD 2300 separator, and LiNiCoO₂ and LiCoO₂. Safety and abuse tests to which the batteries were subjected included random vibration, shock, temperature shock, high temperature exposure, altitude simulation, external short circuit, over discharge, over charge, crush, and puncture. Conclusions include the lack of explosions or cell case ruptures as well as two failed ventings.

CASI

Lithium Batteries; Destructive Tests

20010083876 Bettis Atomic Power Lab., West Mifflin, PA USA

Spectral Emittance and Stability of Coatings and Textured Surfaces for Thermophotovoltaic (TPV) Radiator Applications

Cockeram, B. V.; Hollenbeck, J. L.; 2001; 22p; In English

Report No.(s): DE2001-774254; B-T-3295; No Copyright; Avail: Department of Energy Information Bridge

Coatings or surface modifications are needed to improve the surface emissivity of materials under consideration for TPV radiator applications to a value of 0.8 or higher. Vacuum plasma spray coatings (ZrO₂ + 18% TiO₂ + 10% Y₂O₃, ZrC, Fe₂TiO₅, ZrTiO₄, ZrO₂ + 8% Y₂O₃ + 2% HfO₂, and Al₂O₃ + TiO₂) and a chemical vapor deposited coating of rhenium whiskers were used to increase the surface emissivity of refractory metal and nickel-base materials. Emittance measurements following 4000 hours of vacuum annealing at 1100 C show that only the ZrO₂ + 18% TiO₂ + 10% Y₂O₃, ZrC, and Al₂O₃ + TiO₂ coatings have the desired thermal stability, and maintain emissivity values higher than 0.8. These coatings are graybody emitters, and provide a high emissivity value in the wavelength range that is relevant to the TPV cells. The highest emissivity values were observed for the Al₂O₃ + TiO₂ coatings, with post-anneal values higher than graphite.

NTIS

Emittance; Spectra; Thermal Stability; Sprayed Coatings; Metal Surfaces; Emissivity; Thermophotovoltaic Conversion

20010084296 Argonne National Lab., IL USA

Design and Modeling of Cylindrical and Flat-Wound Lithium-Ion Cells for the PNGV Application

Nelson, P. A.; Henriksen, G. L.; Amine, K.; Oct. 2000; 16p; In English

Report No.(s): DE2001-768613; ANL/CMT/CP-103352; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this study, 10-Ah cylindrical and flat-wound cells were designed and studied for use in batteries for the Partnership for a New Generation of Vehicles (PNGV). A low-cost current collection system was devised that results in a low resistance. Heat rejection from flat cells is much better than that from cylindrical cells and is an important safety factor. Very compact, powerful batteries of about 1.5 kW/L can be designed with wound lithium-ion cells.

NTIS

Lithium Batteries; Electric Batteries; Design Analysis; Vehicles

20010086244 Sandia National Labs., Albuquerque, NM USA

Dynamic In-situ X-ray Diffraction of Catalyzed Alanates

Gross, K. J.; Sandrock, G.; Thomas, G. J.; Dec. 20, 2000; 18p; In English

Report No.(s): DE2001-769323; SAND2000-8899; No Copyright; Avail: Department of Energy Information Bridge

The discovery that hydrogen can be reversibly absorbed and desorbed from NaAlH₄ by the addition of catalysts has created an entirely new prospect for lightweight hydrogen storage. NaAlH₄ releases hydrogen through the following set of decomposition reactions. These decomposition reactions as well as the reverse recombination reactions were directly observed using time-resolved in-situ x-ray powder diffraction. These measurements were performed under conditions similar to those found in PEM fuel cell operations. In this study, the alanate was doped with a catalyst by dry ball-milling NaAlH₄ with 2 mol.% solid TiCl₃. X-ray diffraction clearly showed that TiCl₃ reacts with NaAlH₄ to form NaCl during the doping process. Partial desorption of NaAlH₄ was even observed to occur during the catalyst doping process.

NTIS

X Ray Diffraction; Catalysis; Catalysts

20010086953 Brookhaven National Lab., Upton, NY USA

Regulations on Photovoltaic Module Disposal and Recycling

Fthenakis, V.; 2001; 102p; In English

Report No.(s): DE2001-777781; BNL-68142; No Copyright; Avail: Department of Energy Information Bridge

Environmental regulations can have a significant impact on product use, disposal, and recycling. This report summarizes the basic aspects of current federal, state and international regulations which apply to end-of-life photovoltaic (PV) modules and PV manufacturing scrap destined for disposal or recycling. It also discusses proposed regulations for electronics that may set the ground of what is to be expected in this area in the near future. In the USA, several states have started programs to support the recycling of electronic equipment, and materials destined for recycling often are excepted from solid waste regulations during the collection, transfer, storage and processing stages. California regulations are described separately because they are different from those of most other states.

NTIS

Photovoltaic Cells; Recycling; Regulations; Electronic Equipment; Environment Protection

20010086954 Department of Energy, Office of Energy Efficiency and Renewable Energy, Washington, DC USA

Passive Solar Design: The Foundation for Low-Energy Federal Buildings

Nov. 2000; 8p; In English

Report No.(s): DE2001-775747; DOE/GO-102000; No Copyright; Avail: Department of Energy Information Bridge

The Federal government, which now owns or occupies more than 500,000 facilities, is taking a look at passive solar and low-energy building designs for both new construction and renovations. Passive solar design strategies involve more than just using large, south facing windows to capture some of the sun's warmth. They also include the use of natural light (daylighting), appropriate insulation, high-performance window glazings, and optimum building layouts and orientations with respect to the path of the sun in the sky. Passive solar strategies are the foundation of low-energy buildings designs.

NTIS

Energy Conservation; Solar Energy; Design Analysis; Structural Design; Construction

45

ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20010083028 Midwest Research Inst., Cary, NC USA

Laboratory Plan for Reference Spectrum Measurements

Jun. 14, 1999; 66p; In English

Report No.(s): PB2001-107290; No Copyright; Avail: Issuing Activity

The objective is to obtain accurate hexane measurements from Fourier Transform Infrared Spectrometry spectra recorded at field tests at iron and steel sintering plants and at steel foundry plants. The approach is to measure reference spectra of some organic compounds that are not included in the EPA reference spectrum library and then use these new reference spectra in revised

analyses of the field test spectra. The revised analyses will provide better discrimination of the hexane component from the absorbance bands of the organic mixture.

NTIS

Infrared Spectra; Chemical Analysis; Spectrum Analysis

20010083083 NASA Goddard Space Flight Center, Greenbelt, MD USA

Icehouse Effect: A Selective Arctic Cooling Trend Current Models are Missing

Wetzel, Peter J., NASA Goddard Space Flight Center, USA; [2001]; 4p; In English; 1st; 1st International Conference on Global Warming, 19-24 Aug. 2001, Halifax, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The icehouse effect is a hypothesized climate feedback mechanism which could result in human-caused surface cooling trends in polar regions. Once understood in detail, it becomes apparent that these trends, which are discernable in the literature, but have been largely dismissed, do not conflict with the consensus assessment of the evidence, which infers century-scale Arctic warming. In fact, confirmation of the hypothesis would substantially strengthen the argument that there is a detectable human influence on today's climate. This apparent enigma is resolved only through careful attention to the detail of the hypothesis and the data supporting it. The posited surface cooling is entirely dependent on the existence of climate warming in layers capping the stable boundary layer. Also, the cooling is not pandemic, but is selective. It is readily revealed in properly sorted data by making use of the principles of micrometeorological similarity. Specifically, the cooling is manifest under a range of favorable turbulence conditions which can develop and disappear locally on time scales of minutes to hours because of the intrinsically intermittent nature of stable boundary layer turbulence. Because of the fine-scale nature of the processes which produce the cooling, modeling it is a difficult proposition. Vertical resolution on the order of 1 meter is required. Adequate models of intermittent surface fluxes coupled with radiation exchange do not currently exist, not as parameterizations for aggregated systems, nor in large eddy simulation (LES) models. This presentation will introduce the theory. An important testable null hypothesis emerges: the icehouse effect produces a unique signature or "fingerprint" which could not be produced by any other known process. The presence of this signature will be demonstrated using nearly all available Arctic temperature observations. Its aggregate effect is clearly found in Arctic monthly surface temperature trends when sorted by climatological stability. Using all available Arctic rawinsonde ascents - about 1.1 million profiles, "frozen moments" of the icehouse processes are captured in various states. Because turbulent time scales are so short in the stable boundary layer, each of these snapshots can be treated as independent -- their chronology is irrelevant. Micrometeorological similarity is invoked to reassemble the soundings into bins of similar stability and it is in a wide, coherent range of these stability bins where the cooling effect is revealed.

Author

Arctic Regions; Surface Cooling; Surface Temperature; Climate Change; Micrometeorology; Climate Models; Atmospheric Boundary Layer

20010083351 Environmental Protection Agency, Office of Water, Washington, DC USA

Method 1631, Revision C: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry

Mar. 2001; 40p; In English

Report No.(s): PB2001-102796; EPA/821/R-01/024; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Method 1631 (the 'Method') supports water quality monitoring programs authorized under the Clean Water Act (CWA; the 'Act'). CWA Section 304(a) requires EPA to publish water quality criteria that reflect the latest scientific knowledge concerning the physical fate (e.g., concentration and dispersal) of pollutants, the effects of pollutants on ecological and human health, and the effect of pollutants on biological community diversity, productivity, and stability. CWA Section 303 requires each State to set a water quality standard for each body of water within its boundaries. A State water quality standard consists of a designated use or uses of a waterbody or a segment of a waterbody, the water quality criteria that are necessary to protect the designated use or uses, and an antidegradation policy. These water quality standards serve two purposes: (1) they establish the water quality goals for a specific waterbody, and (2) they are the basis for establishing water quality-based treatment controls and strategies beyond the technology-based controls required by CWA Sections 301(b) and 306.

NTIS

Oxidation; Mercury (Metal); Purging; Water Quality; Quality Control; Atomic Spectra; Pollution Monitoring; Analytical Chemistry; Chemical Analysis; Water Pollution

20010083358 NASA Ames Research Center, Moffett Field, CA USA

Hydrogen Biogeochemistry in Anaerobic and Photosynthetic Ecosystems

Hoehler, Tori M., NASA Ames Research Center, USA; Oct. 05, 2000; 1p; In English, 5 Dec. 2000, Bremen, Germany
Contract(s)/Grant(s): RTOP 344-38-32-03; No Copyright; Avail: Issuing Activity; Abstract Only

The simple biochemistry of molecular hydrogen is central to a large number of microbial processes, affecting the interaction of organisms with each other and with the environment. In anoxic sediments, a great majority of microbial redox processes involve hydrogen as a reactant, product or potential by-product. Accordingly, the energetics (thermodynamics) of each of these processes is affected by variations in local H₂ concentrations. It has long been established that this effect is important in governing microbe-microbe interactions and there are multiple demonstrations that "interspecies hydrogen transfer" can alter the products of, inhibit/stimulate, or even reverse microbial metabolic reactions. In anoxic sediments, H₂ concentrations themselves are thought to be controlled by the thermodynamics of the predominant H₂-consuming microbial process. In sediments from Cape Lookout Bight, this relationship quantitatively describes the co-variation of H₂ concentrations with temperature (for methanogens and sulfate reducers) and with sulfate concentration (for sulfate reducers). The quantitative aspect is important for two reasons: 1) it permits the modeling of H₂-sensitive biogeochemistry, such as anaerobic methane oxidation or pathways of organic matter remineralization, as a function of environmental controls; 2) for such a relationship to be observed requires that intracellular biochemistry and bioenergetics are being directly expressed in a component of the extracellular medium. H₂ could therefore be utilized as a non-invasive probe of cellular energetic function in intact microbial ecosystems. Based on the latter principle we have measured down-core profiles of H₂ and other relevant physico-chemical parameters in order to calculate the metabolic energy yields (DG) that support microbial metabolism in Cape Lookout Bight sediments. Methanogens in this system apparently function with energy yields significantly smaller than the minimum requirements suggested by pure culture studies. Our recent work has extended the study of hydrogen to cyanobacterial mat communities. The large amounts of reducing power generated during photosynthetic activity carry the potential to contribute a swamping term to the H₂ economy of the anaerobic microbial populations within the mat - and thereby to alter the population structure and biogeochemical function of the mat as a whole. In hypersaline microbial mats, we observe a distinct diel cycle in H₂ production and a substantial corresponding flux. On an early Earth dominated by microbial mats, this transmission of photosynthetic reducing power may have carried important implications for both biospheric and atmospheric evolution.

Author

Biogeochemistry; Ecosystems; Hydrogen; Anaerobes; Photosynthesis

20010083875 Westinghouse Savannah River Co., Savannah River Site, Aiken, SC USA

Metallurgical Laboratory (MetLab) Treatability Study: An Analysis of Passive Soil Vapor Extraction Wells (PSVE) June 2000 Update

Riha, B. D.; Rossabi, J.; Hyde, W. K.; Jun. 2000; 38p; In English; Original contains color illustrations

Report No.(s): DE2001-774274; WSRC-TR-2000-00182; No Copyright; Avail: Department of Energy Information Bridge

The passive soil vapor extraction (PSVE) system at the MetLab of the Savannah River Site has been operating since May 1998. The results to date on the treatability study indicate the technology is performing well. Well concentrations are decreasing and contour maps of the vadose zone soil gas plume show a decrease in the extent of the plume. In the 2 years of operation approximately 270 pounds of chlorinated organic contaminants have been removed by natural barometric pumping of wells fitted with BaroBall valves (low pressure check valves). Additional characterization was completed in FY00 to evaluate the concentration of the soil gas plume on the south and west sides of the well field. One well was installed and two soil gas pushes were completed. The maximum soil gas concentrations observed from both CPT soil gas pushes were 3.0 ppmv PCE, 3.5 ppmv TCE, and 4.5 ppmv Freon 113.

NTIS

Metallurgy; Soils; Vapors; Extraction; Wells

20010083955 NASA Goddard Inst. for Space Studies, New York, NY USA

A Chronology of Annual-Mean Effective Radii of Stratospheric Aerosols from Volcanic Eruptions During the Twentieth Century as Derived From Ground-based Spectral Extinction Measurements

Strothers, Richard B., NASA Goddard Inst. for Space Studies, USA; Jul. 02, 2001; 29p; In English

Report No.(s): GCN-01-29; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Stratospheric extinction can be derived from ground-based spectral photometric observations of the Sun and other stars (as well as from satellite and aircraft measurements, available since 1979), and is found to increase after large volcanic eruptions. This increased extinction shows a characteristic wavelength dependence that gives information about the chemical composition and the effective (or area weighted mean) radius of the particles responsible for it. Known to be tiny aerosols constituted of sulfuric

acid in a water solution, the stratospheric particles at midlatitudes exhibit a remarkable uniformity of their column-averaged effective radii $r(\text{sub eff})$ in the first few months after the eruption. Considering the seven largest eruptions of the twentieth century, $r(\text{sub eff})$ at this phase of peak aerosol abundance is approx. 0.3 micrometers in all cases. A year later, $r(\text{sub eff})$ either has remained about the same size (almost certainly in the case of the Katmai eruption of 1912) or has increased to approx. 0.5 micrometers (definitely so for the Pinatubo eruption of 1991). The reasons for this divergence in aerosol growth are unknown.

Author

Aerosols; Extinction; Stratosphere; Sulfuric Acid; Volcanoes; Atmospheric Composition

20010083956 NASA Langley Research Center, Hampton, VA USA

A 3-Year Climatology of Cloud and Radiative Properties Derived from GOES-8 Data Over the Southern Great Plains

Khayer, M. M., Analytical Services and Materials, Inc., USA; Rapp, A. D., Analytical Services and Materials, Inc., USA; Doelling, D. R., Analytical Services and Materials, Inc., USA; Nordeen, M. L., Analytical Services and Materials, Inc., USA; Minnis, P., NASA Langley Research Center, USA; Smith, W. L., Jr., NASA Langley Research Center, USA; Nguyen, L., NASA Langley Research Center, USA; [2001]; 11p; In English; 11th ARM Science Team Meeting Proceedings, 19-23 Mar. 2001, Atlanta, GA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

While the various instruments maintained at the Atmospheric Radiation Measurement (ARM) Program Southern Great Plains (SGP) Central Facility (CF) provide detailed cloud and radiation measurements for a small area, satellite cloud property retrievals provide a means of examining the large-scale properties of the surrounding region over an extended period of time. Seasonal and inter-annual climatological trends can be analyzed with such a dataset. For this purpose, monthly datasets of cloud and radiative properties from December 1996 through November 1999 over the SGP region have been derived using the layered bispectral threshold method (LBTM). The properties derived include cloud optical depths (ODs), temperatures and albedos, and are produced on two grids of lower (0.5 deg) and higher resolution (0.3 deg) centered on the ARM SGP CF. The extensive time period and high-resolution of the inner grid of this dataset allows for comparison with the suite of instruments located at the ARM CF. In particular, Whole-Sky Imager (WSI) and the Active Remote Sensing of Clouds (ARSCL) cloud products can be compared to the cloud amounts and heights of the LBTM 0.3 deg grid box encompassing the CF site. The WSI provides cloud fraction and the ARSCL computes cloud fraction, base, and top heights using the algorithms by Clothiaux et al. (2001) with a combination of Belfort Laser Ceilometer (BLC), Millimeter Wave Cloud Radar (MMCR), and Micropulse Lidar (MPL) data. This paper summarizes the results of the LBTM analysis for 3 years of GOES-8 data over the SGP and examines the differences between surface and satellite-based estimates of cloud fraction.

Author

Climatology; Cloud Physics; Radiation Measurement

20010084181 NASA Goddard Space Flight Center, Greenbelt, MD USA

Ozone Loss From Quasi-Conservative Coordinate Mapping During the 1999-2000 SOLVE Campaign

Lait, L. R., NASA Goddard Space Flight Center, USA; Schoeberl, M. R., NASA Goddard Space Flight Center, USA; Newman, P. A., NASA Goddard Space Flight Center, USA; McGee, T., NASA Goddard Space Flight Center, USA; Burris, J., NASA Goddard Space Flight Center, USA; Browell, E. V., NASA Goddard Space Flight Center, USA; Richard, E., NASA Goddard Space Flight Center, USA; Braathen, G. O., NASA Goddard Space Flight Center, USA; Bojkov, B. R., NASA Goddard Space Flight Center, USA; Goutail, F., NASA Goddard Space Flight Center, USA; [2001]; 39p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the winter of 1999-2000, the Sage III Ozone Loss and Validation Experiment (SOLVE) field experiment took place in Kiruna, Sweden. The purpose of SOLVE was to examine ozone depletion mechanisms in the Arctic stratosphere (from about 10 to 50 km altitude) during the winter and early spring, when a band of strong winds (the 'polar vortex') circle the pole. Measurements of stratospheric ozone were made by several different kinds of instruments in different meteorological situations. We analyzed these data using the 'quasi-conservative coordinate mapping' technique, in which the measurements are analyzed in terms of meteorological properties ('potential temperature' and 'potential vorticity') which tend not to change very much over a few days. This technique reduces or removes the changes that are associated with the polar vortex moving around. Over longer time periods, potential temperature and potential vorticity change as air cools and descends within the polar vortex. We account for these changes by calculating the trajectories of air parcels, and this enables us to extend the analysis over a ten-week period from January 10 to March 17, 2000. Using data from the NASA ER-2 aircraft, from the DIAL and AROTEL laser sounders on the NASA DC-8 aircraft, and balloon-borne ozonesondes, our analysis reveals changes in ozone which, because we have removed the effects of polar vortex motion and the descending air, indicate chemical destruction of ozone in early 2000. We find a peak

decline rate of approximately 0.03 ppmv/day near 470 K of potential temperature (near 20 km) in mid-January which sinks in altitude to around 440 K (near 18 km) in mid-March.

Author

Arctic Regions; Ozone Depletion; Vortices; Stratosphere; Ozonometry

20010084265 California Univ., San Diego, Scripps Experimental Climate Prediction Center, La Jolla, CA USA

Routine High-Resolution Forecasts/Analyses for the Pacific Disaster Center: User Manual *Final Report, 1 Sep. 1999 - 31 Aug. 2001*

Roads, John, California Univ., San Diego, USA; Han, J., California Univ., San Diego, USA; Chen, S., California Univ., San Diego, USA; Burgan, R., Forest Service, USA; Fujioka, F., Forest Service, USA; Stevens, D., Hawaii Univ., USA; Funayama, D., Hawaii Univ., USA; Chambers, C., Hawaii Univ., USA; Bingaman, B., Hawaii Univ., USA; McCord, C., Maui High Performance Computer Center, USA; Aug. 31, 2001; 115p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG5-8780; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Enclosed herein is our HWCMD user manual. This manual constitutes the final report for our NASA/PDC grant, NASA NAG5-8730, "Routine High Resolution Forecasts/Analysis for the Pacific Disaster Center". Since the beginning of the grant, we have routinely provided experimental high resolution forecasts from the RSM/MSM for the Hawaii Islands, while working to upgrade the system to include: (1) a more robust input of NCEP analyses directly from NCEP; (2) higher vertical resolution, with increased forecast accuracy; (3) faster delivery of forecast products and extension of initial 1-day forecasts to 2 days; (4) augmentation of our basic meteorological and simplified fireweather forecasts to fire danger and drought forecasts; (5) additional meteorological forecasts with an alternate mesoscale model (MM5); and (6) the feasibility of using our modeling system to work in higher-resolution domains and other regions. In this user manual, we provide a general overview of the operational system and the mesoscale models as well as more detailed descriptions of the models. A detailed description of daily operations and a cost analysis is also provided. Evaluations of the models are included although it should be noted that model evaluation is a continuing process and as potential problems are identified, these can be used as the basis for making model improvements. Finally, we include our previously submitted answers to particular PDC questions (Appendix V). All of our initially proposed objectives have basically been met. In fact, a number of useful applications (VOG, air pollution transport) are already utilizing our experimental output and we believe there are a number of other applications that could make use of our routine forecast/analysis products. Still, work still remains to be done to further develop this experimental weather, climate, fire danger and drought prediction system. In short, we would like to be a part of a future PDC team, if at all possible, to further develop and apply the system for the Hawaiian and other Pacific Islands as well as the entire Pacific Basin.

Author

Climate; Drought; Fires; Pacific Islands; Prediction Analysis Techniques; Meteorology; Atmospheric Models; Weather Forecasting

20010084905 City Univ. of New York, Dept. of Physical, Environmental and Computer Sciences, Brooklyn, NY USA

Air, Ocean and Climate Monitoring Enhancing Undergraduate Training in the Physical, Environmental and Computer Sciences

Hope, W. W., City Univ. of New York, USA; Johnson, L. P., City Univ. of New York, USA; Obl, W., City Univ. of New York, USA; Stewart, A., City Univ. of New York, USA; Harris, W. C., City Univ. of New York, USA; Craig, R. D., City Univ. of New York, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 85-89; In English; See also 20010084895; Sponsored in part by Brooklyn Borough President's Fund, New York State Graduate Research and Technology Initiative and City of New York Collaborative Research Program; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Faculty in the Department of Physical, Environmental and Computer Sciences strongly believe in the concept that undergraduate research and research-related activities must be integrated into the fabric of our undergraduate Science and Technology curricula. High level skills, such as problem solving, reasoning, collaboration and the ability to engage in research, are learned for advanced study in graduate school or for competing for well paying positions in the scientific community. One goal of our academic programs is to have a pipeline of research activities from high school to four year college, to graduate school, based on the GISS Institute on Climate and Planets model.

Author

Research and Development; Problem Solving; Technologies; Schools; Education; Marine Meteorology

20010084911 City Univ. of New York, Dept. of Physical, Environmental and Computer Sciences, Brooklyn, NY USA

Total Optical Depth Analysis for NO₂, O₃ and Aerosols by a Multi-Filter Shadowband Radiometer

Williamson, Lorenzo, City Univ. of New York, USA; Mebane, Lloyd, Stuyvesant High School, USA; Brathwaite, Kevin,

Manhattan Transaction High School, USA; Craig, R., City Univ. of New York, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 111-114; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The main focus of this research is the retrieval of tropospheric aerosol information using a Multi-filter Rotating Shadowband Radiometer, Model MFR-7, placed on the roof of the Science Building at Medgar Evers College. This instrument makes precise measurements of atmospheric extinction of the direct solar beam simultaneously at six wavelengths (475, 500, 615, 670, 840 and 940 nm) at one minute intervals throughout the day. We are interested in measuring the changes in the optical depth of ambient aerosols, mass, effective particle size, aerosol size distribution, and chemical composition of ambient particulate matter in the Greater New York City Area. Results will be compared with data obtained by A. Lacis, B. Carlson and B. Cairns at the NASA Goddard Institute for Space Studies.

Author

Aerosols; Optical Thickness; Particle Size Distribution; Troposphere; Radiometers; Chemical Composition

20010086427 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

Comparison of Modeled Ozone Distributions with Ozonesonde Observations in the Tropics

Puts, Rob; 2001; ISSN 0169-1651; 44p; In English; Original contains color illustrations

Report No.(s): KNMI-WR-2001-02; ISBN 90-369-2191-0; Copyright; Avail: Issuing Activity

Modelling as a tool for supporting research on major scientific questions in atmospheric chemistry and climate research, has received a lot of attention during the last decades. Many aspects of modelling atmospheric processes have been investigated. In this report, the global three-dimensional chemistry transport model of the Royal Netherlands Meteorological Institute (KNMI), TM3, is used to compare ozonesonde profiles in the tropics with corresponding modeled ozone distributions in order to validate the model results for ozone. TM3 uses 6-hourly meteorological data from European Centre for Medium-Range Weather Forecasts (ECMWF)- analysis and includes parameterisations for subgrid scale processes such as convection. TM3 includes an ozone chemistry module containing the methane and carbon monoxide oxidation chain for the troposphere and lower stratosphere. Our study was limited to three ozonesonde stations in the tropics: Ascension Island, Nairobi and San Cristobal. Generally, monthly mean modeled ozone profiles compare reasonably well for all three stations with the natural variability constructed from all the available observations in the corresponding months, except for the upper stratosphere (above 50 mbar). In the upper stratosphere, an evident systematic deviation is visible. From this, it can be concluded that the prescribed climatology for the upper stratosphere in TM3 is less reliable for the tropics, due to the low number of included observations in the tropics. Furthermore, the seasonality of ozone for the ozonesonde stations Ascension Island and Nairobi has been investigated. For Ascension Island, which is located on an island far away from the continents and therefore should not be affected by local pollution, the seasonality is reproduced quite well by TM3, except for - again - the upper stratosphere. For Nairobi, which is located at the equatorial East-coast of Afrika, the seasonality is only reproduced reasonably when in the lower troposphere. Finally, an attempt has been made to investigate the possibility to reproduce daily changes in ozone profiles with TM3. For this, individual soundings in September 1998 at the San Cristobal station were simulated. The conclusion is that the modeled ozone profiles are not accurate or sensitive enough to show detailed features. Probably this can be explained by the very high spatial and temporal resolution required to reproduce these fine structures. The used model resolution of 80 x 100 x 19 vertical layers is probably not fine enough.

Author

Ozone; Three Dimensional Models; Transport Properties; Atmospheric Chemistry; Meteorological Parameters; Climatology; Methane; Carbon Monoxide

20010086589 Oak Ridge National Lab., TN USA

Ecological Risk Assessment Framework for Low-Altitude Overflights by Fixed-Wing and Rotary-Wing Military Aircraft

Efroymsen, R. A.; Rose, W. H.; Nemeth, S.; Sutter, G. W.; 2001; 120p; In English

Report No.(s): PB2001-106585; ORNL-TM-2000/289; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Acknowledgments; Introduction; Problem Formulation for Overflights; Characterization of Exposure; Characterization of Effects; Intermediate Risk Characterization; Activity-Specific Risk Characterization; Conclusions; Figures; References; and Appendix A.

NTIS

Aircraft Noise; Ecology; Attack Aircraft; Low Altitude

20010087012 California Univ., Lawrence Berkeley Lab., Environmental Energy Technologies Div., Berkeley, CA USA

Preliminary Assessment of Potential CDM Early Start Projects in Brazil

Meyers, S.; Sathaye, J.; Lehman, B.; Schumacher, K.; vanVliet, W.; Nov. 2000; 60p; In English

Report No.(s): DE2001-776604; LBNL-46120; No Copyright; Avail: Department of Energy Information Bridge

The Brazil/U.S. Aspen Global Forum on Climate Change Policies and Programs has facilitated a dialogue between key Brazil and U.S. public and private sector leaders on the subject of the Clean Development Mechanism (CDM). With support from the U.S. government, a cooperative effort between Lawrence Berkeley National Laboratory and the University of Sao Paulo conducted an assessment of a number of projects put forth by Brazilian sponsors. An important goal was to assess the potential impact of Certified Emission Reductions (CERs) on the financial performance of projects. All of the projects contribute to economic development in Brazil. The forestry projects in particular would create a significant number of rural jobs, and contribute income to rural communities. Some of the carbon sequestration projects would provide environmental benefits with respect to protection of biodiversity and soil.

NTIS

Forest Management; Economic Development; Climate Change; Climatology; Project Planning

20010087128 NASA Ames Research Center, Moffett Field, CA USA

On the Feasibility of Studying Shortwave Aerosol Radiative Forcing of Climate Using Dual-Wavelength Aerosol Backscatter Lidar

Redemann, Jens, Bay Area Environmental Research Inst., USA; Russell, Philip B., NASA Ames Research Center, USA; Winker, David M., NASA Langley Research Center, USA; McCormick, M. Patrick, Hampton Univ., USA; [2000]; 1p; In English; 20th International Laser Radar Conference, 10-14 Jul. 2000, Vichy, France

Contract(s)/Grant(s): RTOP 146-10-04-51-78; No Copyright; Avail: Issuing Activity; Abstract Only

The current low confidence in the estimates of aerosol-induced perturbations of Earth's radiation balance is caused by the highly non-uniform compositional, spatial and temporal distributions of tropospheric aerosols on a global scale owing to their heterogeneous sources and short lifetimes. Nevertheless, recent studies have shown that the inclusion of aerosol effects in climate model calculations can improve agreement with observed spatial and temporal temperature distributions. In light of the short lifetimes of aerosols, determination of their global distribution with space-borne sensors seems to be a necessary approach. Until recently, satellite measurements of tropospheric aerosols have been approximate and did not provide the full set of information required to determine their radiative effects. With the advent of active aerosol remote sensing from space (e.g., PICASSO-CENA), the applicability of lidar-derived aerosol 180 deg -backscatter data to radiative flux calculations and hence studies of aerosol effects on climate needs to be investigated.

Author

Aerosols; Backscattering; Optical Radar; Remote Sensing; Feasibility Analysis; Radiative Heat Transfer

20010087130 NASA Ames Research Center, Moffett Field, CA USA

Desert Dust Layers Over Polluted Marine Boundary Layers: ACE-2 Measurements and ACE-Asia Plans

Russell, Philip B., NASA Ames Research Center, USA; Schmid, B., Bay Area Environmental Research Inst., USA; Livingston, J. M., SRI International Corp., USA; Redemann, J., Bay Area Environmental Research Inst., USA; Bergstrom, R. W., Bay Area Environmental Research Inst., USA; [2000]; 1p; In English; AGU 2000 Western Pacific Geophysics Meeting, Unknown; Sponsored by American Geophysical Union, USA

Contract(s)/Grant(s): RTOP 146-10-04-51-78; No Copyright; Avail: Issuing Activity; Abstract Only

Aerosols in ACE-Asia are expected to have some commonalities with those in ACE-2, along with important differences. Among the commonalities are occurrences of desert dust layers over polluted marine boundary layers. Differences include the nature of the dust (yellowish in the East Asia desert outflow, vs. reddish-brown in the Sahara Outflow measured in ACE-2) and the composition of boundary-layer aerosols (e.g., more absorbing, soot and organic aerosol in-the Asian plume, caused by coal and biomass burning, with limited controls). In this paper we present ACE-2 measurements and analyses as a guide to our plans for ACE-2 Asia. The measurements include: (1) Vertical profiles of aerosol optical depth and extinction (380-1558 nm), and of water vapor column and concentration, from the surface through the elevated desert dust, measured by the 14-channel Ames Airborne Tracking Sunphotometer (AATS-14); (2) Comparisons of airborne and shipborne sunphotometer optical depths to satellite-retrieved values, with and without desert dust; (3) Comparisons between airborne Sunphotometer optical depth and extinction spectra and those derived from coincident airborne in situ measurements of aerosol size distribution, scattering and absorption; (4) Comparisons between size distributions measured in situ and retrieved from sunphotometer optical depth spectra; (5) Comparisons between aerosol single scattering albedo values obtained by several techniques, using various combinations of measurements of backscatter, extinction, size distribution, scattering, absorption, and radiative flux. We show how analyses of

these data can be used to address questions important to ACE-Asia, such as: (1) How do dust and other absorbing aerosols affect the accuracy of satellite optical depth retrievals? How important are asphericity effects? (2) How important are supermicron dust and seasalt aerosols to overall aerosol optical depth and radiative forcing? How well are these aerosols sampled by aircraft inlets and instruments? (3) How consistent are suborbital in situ and remote measurements of aerosols, among themselves and with satellite retrievals? What are the main reasons for observed inconsistencies?

Author

Asia; Remote Sensing; Boundary Layers; Advanced Composition Explorer; Deserts; Contamination

20010087662 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Effect of Solar Proton Events on Ozone and Other Constituents in the Middle Atmosphere

Jackman, Charles H., NASA Goddard Space Flight Center, USA; McPeters, Richard D., NASA Goddard Space Flight Center, USA; Labow, Gordon J., NASA Goddard Space Flight Center, USA; Fleming, Eric L., NASA Goddard Space Flight Center, USA; Russell, James M., NASA Goddard Space Flight Center, USA; Praderas, Cid J., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; ISCS 2001: Solar Variability, Climate and Space Weather Symposium, 13-16 Jun. 2001, Longmont, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Solar proton events (SPEs) can result in increases in both HO(x) (H, OH, HO₂) and NO(x) (N, NO, NO₂) constituents in the middle atmosphere polar region (>60 degrees geomagnetic). FIO(x) constituents produced by SPEs caused decreases in mesospheric and upper stratospheric ozone observed during several events. Recent SPEs in July and November of 2000 caused ozone decreases of over 30 percent during the event as measured by UARS HALOE and NOAA 14 SBUV/2. These HO(x)-driven ozone depletions last only during the SPEs (several hours to a few days) because of the short lifetimes of HO(x) constituents in the atmosphere. The NO(x) species feed into the entire odd nitrogen family NO(y) (N, NO, NO₂, NO₃, N₂O₅, HNO, 14NO₄, ClONO₂, BrONO₂) over a period of hours to weeks. The NO(y) family lasts several months or more in the stratosphere with low sun conditions. The two largest SPEs in the past 30 years, October 1989 and August 1972, caused polar stratospheric ozone depletions is greater than 10 percent for weeks past the events. The SPE in July 2000, third largest in 30 years, was measured by NOAA 14 SBUV/2 to decrease ozone by several percent for days past the event. Enhancements in mesospheric NO(x) of over 50 ppbv were also measured by UARS HALOE during this event. A review of the influence of SPEs on ozone and other constituents in the middle atmosphere will be given in this talk.

Author

Solar Protons; Ozone; Hydrogen Compounds; Nitrogen Oxides; Atmospheric Composition; Mesosphere; Stratosphere; Geomagnetism

20010087775 National Aerospace Lab., Flight Div., Tokyo, Japan

Airborne Observation of Atmospheric Carbon Dioxide over Sagami-Bay, Japan

Machida, T.; Yazawa, K.; Tagashira, T.; Inoue, G.; Tamaru, T.; Jan. 2001; 18p; In Japanese; Portions of this document are not fully legible

Report No.(s): PB2001-106899; NAL-TR-1422; Copyright; Avail: National Technical Information Service (NTIS)

In order to ascertain temporal and spatial variations in atmospheric carbon dioxide (CO₂) levels near the Tokyo metropolitan area, air samples have been collected by airplane since December 1996, over Sagami-Bay in Japan. Sampling was carried out monthly from December 1996 to May 1997 and twice a month from June 1997 to December 1999, at eight altitudes from 0.5km to 7km. The CO₂ concentration in these samples shows clear seasonal variation and secular increase.

NTIS

Atmospheric Composition; Carbon Dioxide Concentration; Air Pollution

20010087783 NASA Goddard Space Flight Center, Greenbelt, MD USA

Atmospheric Gravitational Torque Variations Based on Various Gravity Fields

Sanchez, Braulio V., NASA Goddard Space Flight Center, USA; Rowlands, David, NASA Goddard Space Flight Center, USA; [2001]; 2p; In English; American Geophysical Union 2001 Spring Meeting, 29 May - 2 Jun. 2001, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Advancements in the study of the Earth's variable rate of rotation and the motion of its rotation axis have given impetus to the analysis of the torques between the atmosphere, oceans and solid Earth. The output from global general circulation models of the atmosphere (pressure, surface stress) is being used as input to the torque computations. Gravitational torque between the atmosphere, oceans and solid Earth is an important component of the torque budget. Computation of the gravitational torque

involves the adoption of a gravitational model from a wide variety available. The purpose of this investigation is to ascertain to what extent this choice might influence the results of gravitational torque computations.

Author

Earth Rotation; Gravitational Fields; Torque; Atmospheric Pressure

20010087787 Science Applications International Corp., San Diego, CA USA

Radiation Environment Program (REP) 1992 to 1994, 24 Mar. 1992 - 31 Jan. 1997

Kaul, Dean C.; Egbert, Stephen D.; Sep. 2000; 61p; In English

Contract(s)/Grant(s): DNA001-92-C-0082

Report No.(s): AD-A392711; SAIC-98/1000; DSWA-TR-98-2; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This is a report of radiation transport computations by Science Applications International Corporation (SAIC), under contract to the Defense Special Weapons Agency (DSWA). It describes efforts to verify and validate the MASH shielding system and its associated DABL69 (ENDF/B-V) cross section set. The report describes MASH calculations of free field fluence and kerma intended to match neutron and gamma ray fluence and dose measurements made at Aberdeen Pulse Radiation Facility (APRF). It describes the technical approach taken in performing the calculations, as well as a detailed comparison between calculation and measurements made at APRE between the spring of 1992 and the Fall of 1994, which marked the end of the REP program. Calculations include those using the standard MASH package and those involving revisions and perturbations to the MASH calculations, incorporating new cross section data and new applications of MASH technology. These additions specifically account for forest in the vicinity of a measurement site and examine the effect of revised cross sections, in order to understand and explain discrepancies between calculation and measurement.

DTIC

Radiation Transport; Ionizing Radiation

20010087975 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

Recalibration of GOME Spectra for the Purpose of Ozone Profile Retrieval

vanderA, Ronald, Royal Netherlands Meteorological Inst., Netherlands; Jun. 26, 2001; ISSN 0169-1708; 18p; In English

Report No.(s): KNMI-TR-236; ISBN 90-369-2197-X; Copyright; Avail: Issuing Activity

The satellite instrument GOME (Global Ozone Monitoring Experiment), on board of the ERS-2 mission of ESA (European Space Agency), is measuring backscattered sunlight from the atmosphere in the range from 240 to 790 nm. This spectrum is used for deriving globally, height-resolved information of the ozone distribution in the atmosphere. Contrary to total ozone column retrieval, the retrieval algorithm for ozone profiles requires absolutely calibrated reflectivity spectra. However, the in-flight calibration of the GOME reflectivity spectra needs to be corrected before the spectra can be used for profile retrieval. A method for this calibration correction of the GOME level 1 data is described in this report. The retrieved profiles from the recalibrated reflectivity spectra of GOME differ in the stratosphere up to 50% from retrieved profiles without the correction. With the calibration correction improved ozone profiles are retrieved for the altitude range up to 50 km. Several results from ozone profile retrieval from GOME data have been presented in the past [Munro et al., 1998, Hoogen et al., 1999, van der A et al., 1998]. Munro et al. presented results of retrieved ozone profiles below 30 km. Hoogen et al. excluded the spectrum below 290 nm from their retrieval and corrected the spectrum above 290 nm with empirically derived Chebyshev polynomials. Their retrieved ozone values above the ozone maximum, however, show systematic deviations compared to ozone sondes. Comparison of our initial retrieved ozone profiles with ground measurements (from sondes of the NILU data base and lidar measurements) and ozone measurements from the satellite instrument HALOE (HALogen Occultation Experiment) revealed a strong systematic deviation above 25 km between GOME measurements and other ozone measurements. Ozone profiles from GOME retrieved for the upper stratosphere are not yet published in literature due to radiometric problems of the measured spectrum below 290 nm. In this report these problems are identified, and subsequently corrected for, in order to be able to present accurate ozone profiles for both troposphere and stratosphere.

Author

Ozone; Satellite-Borne Instruments; Sunlight; Radiance; Calibrating; Ozonometry; Atmospheric Sounding; Reflectance

20010088233 Argonne National Lab., Center for Transportation Research, IL USA

Fuel-Cycle Emissions for Conventional and Alternative Fuel Vehicles: An Assessment of Air Toxics

Winebrake, J.; He, D.; Wang, M.; 2001; 92p; In English

Report No.(s): DE2001-768564; ANL/ESD-44; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The report provides information on recent efforts to use the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) fuel-cycle model to estimate air toxics emissions. GREET currently addresses greenhouse gas emissions

and such regulated emissions as volatile organic compounds, nitrogen oxides, and carbon monoxide. This study is significant because it is the first to consider fuel-cycle emissions of these pollutants for alternative transportation fuels. For this study, we evaluated air toxics emissions of the following fuels and vehicle technologies: conventional gasoline, conventional diesel, federal reformulated gasoline, California reformulated gasoline, compressed natural gas, liquefied natural gas, methanol, ethanol, battery-powered electric vehicles, and hybrid electric vehicles.

NTIS

Fuels; Exhaust Emission; Greenhouse Effect; Exhaust Gases; Energy Policy

20010089247 NASA Goddard Space Flight Center, Greenbelt, MD USA

Climate Modeling and Prediction at NSIPP

Suarez, Max, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The talk will review modeling and prediction efforts undertaken as part of NASA's Seasonal to Interannual Prediction Project (NSIPP). The focus will be on atmospheric model results, including its use for experimental seasonal prediction and the diagnostic analysis of climate anomalies. The model's performance in coupled experiments with land and atmosphere models will also be discussed.

Author

Climate Models; Predictions; Forecasting; Atmospheric Models; Periodic Variations

20010089248 NASA Goddard Space Flight Center, Greenbelt, MD USA

Simulation of Climatic Changes in the Arctic and North Atlantic During Recent Decades

Hakkinen, Sirpa, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; Modern Polar Symposium, 23-27 Jun. 2001, Bad Durkheim, Germany; No Copyright; Avail: Issuing Activity; Abstract Only

The interactions of the atmosphere and ice-ocean system in the Arctic will be studied using a coupled ice-ocean model which will also use ice drift derived from microwave observations as forcing. We especially search for linkages between the recent large climatic shifts in the Arctic Ocean and atmosphere for which period we also have microwave sea ice data. The coupled model area covers the whole N. Atlantic thus interactions between the lower latitudes are also investigated because we anticipate that the same large scale atmospheric patterns which dominate the midlatitudes extend their influence on the Arctic. The model hindcast for 1951-1993 shows clear decadal variability in the leading modes of ocean circulation. No specific low-freq modes are expected for the ice drift because its spectrum is white. However, the ice drift exhibits two see-saw patterns in response to the leading atmospheric circulation mode ('Arctic Oscillation'), one of them is the well-known out of phase relationship between Baffin Bay and Barents-Kara Seas, the other one is between Siberian shelf and Alaskan Coast (Hakkinen and Geiger, 2000).

Author

Climate Change; Simulation; Arctic Regions; Periodic Variations; Oscillations; Ocean Models; Climatology; Air Water Interactions

20010089249 NASA Goddard Space Flight Center, Greenbelt, MD USA

Remote Sensing of Aerosol and Non-Aerosol Absorption

Kaufman, Y. J., NASA Goddard Space Flight Center, USA; Dubovik, O., Science Systems and Applications, Inc., USA; Holben, B. N., NASA Goddard Space Flight Center, USA; Remer, L. A., NASA Goddard Space Flight Center, USA; Tanre, D., Centre National de la Recherche Scientifique, France; [2001]; 1p; In English; Chapman Conference, 13 Aug. 2001, Estes Park, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Remote sensing of aerosol from the new satellite instruments (e.g. MODIS from Terra) and ground based radiometers (e.g. the AERONET) provides the opportunity to measure the absorption characteristics of the ambient undisturbed aerosol in the entire atmospheric column. For example LANDSAT and AERONET data are used to measure spectral absorption of sunlight by dust from West Africa. Both Application of the LANDSAT and AERONET data demonstrate that Saharan dust absorption of solar radiation is several times smaller than the current international standards. This is due to difficulties of measuring dust absorption in situ, and due to the often contamination of dust properties by the presence of air pollution or smoke. We use the remotely sensed aerosol absorption properties described by the spectral sin le scattering albedo, together with statistics of the monthly optical thickness for the fine and coarse aerosol derived from the MODIS data. The result is an estimate of the flux of solar radiation absorbed by the aerosol layer in different regions around the globe where aerosol is prevalent. If this aerosol forcing through absorption is not included in global circulation models, it may be interpreted as anomalous absorption in these regions. In a preliminary exercise we also use the absorption measurements by AERONET, to derive the non-aerosol absorption of the atmosphere in cloud free conditions. The results are obtained for the atmospheric windows: 0.44 microns, 0.66 microns, 0.86

microns and 1.05 microns. In all the locations over the land and ocean that were tested no anomalous absorption in these wavelengths, was found within absorption optical thickness of ± 0.005 .

Author

Remote Sensing; Aerosols; Absorption Spectroscopy; Satellite Instruments; Radiometers; Radiation Absorption; Atmospheric Models

46 GEOPHYSICS

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see 47 Meteorology and Climatology; and 93 Space Radiation.

20010083378 NASA Goddard Space Flight Center, Greenbelt, MD USA

Retrieval of Polar Stratospheric Cloud Microphysical Properties from Lidar Measurements: Dependence on Particle Shape Assumptions

Reichardt, J., NASA Goddard Space Flight Center, USA; Reichardt, S., NASA Goddard Space Flight Center, USA; Yang, P., NASA Goddard Space Flight Center, USA; McGee, T. J., NASA Goddard Space Flight Center, USA; [2001]; 46p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A retrieval algorithm has been developed for the microphysical analysis of polar stratospheric cloud (PSC) optical data obtained using lidar instrumentation. The parameterization scheme of the PSC microphysical properties allows for coexistence of up to three different particle types with size-dependent shapes. The finite difference time domain (FDTD) method has been used to calculate optical properties of particles with maximum dimensions equal to or less than $2 \mu\text{m}$ and with shapes that can be considered more representative of PSCs on the scale of individual crystals than the commonly assumed spheroids. Specifically, these are irregular and hexagonal crystals. Selection of the optical parameters that are input to the inversion algorithm is based on a potential data set such as that gathered by two of the lidars on board the NASA DC-8 during the Stratospheric Aerosol and Gas Experiment 0 p (SAGE) Ozone Loss Validation experiment (SOLVE) campaign in winter 1999/2000: the Airborne Raman Ozone and Temperature Lidar (AROTEL) and the NASA Langley Differential Absorption Lidar (DIAL). The 0 microphysical retrieval algorithm has been applied to study how particle shape assumptions affect the inversion of lidar data measured in leewave PSCs. The model simulations show that under the assumption of spheroidal particle shapes, PSC surface and volume density are systematically smaller than the FDTD-based values by, respectively, approximately 10-30% and approximately 5-23%.

Author

Atmospheric Composition; Cloud Physics; Crystals; Ice Clouds; Polar Meteorology; Shapes; Spheroids

20010083993 Steedman (R. Scott), Reading, UK

Earthquake Engineering Support, Phase 4 Final Report

Steedman, R. S.; Sep. 2000; 28p; In English

Contract(s)/Grant(s): N68171-00-M-5505

Report No.(s): AD-A390677; ARDSG-R/D-8922-EN-01; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report describes the initial findings of an experimental study supported by the U.S. Army Centrifuge Research Center and Engineer Earthquake Engineering Research Program (EQEN) into the behavior of saturated sands under high initial effective confining stresses subjected to strong ground shaking. The research was conducted using the Army Centrifuge at the U.S. Army Engineering Research and Development Center (ERDC), located in Vicksburg MS, formerly known as the Waterways Experiment Station (WES). The centrifuge studies have shown that the generation of excess pore pressure is limited to a level less than 100 percent for vertical effective confining stresses exceeding around 3 atmospheres (atm, or 300 KPa). This limit reduces at higher confining stresses. It is likely that this limit is a function of a range of variables, including amplitude of shaking. A second key finding indicates that dense layers overlying loose layers may still be readily liquefied as a consequence of the high excess pore pressures generated below. If verified, the potential benefits from these findings for the design of remediation works for large earth dams could be substantial. The report describes the equipment used for the experiments, the research program, and presents the initial results, contrasting the development of excess pore pressure at low confining stress with that at high confining stress. Possible consequences for a hypothetical dam are discussed.

DTIC

Earthquakes; Research Management; Geological Faults

20010084267 NASA Goddard Inst. for Space Studies, New York, NY USA

The Variability of the Horizontal Circulation in the Troposphere and Stratosphere: A Comparison

Perlwitz, Judith, NASA Goddard Inst. for Space Studies, USA; Graf, Hans-F., Max-Planck-Inst. fuer Meteorologie, Germany; [2001]; 22p; In English

Report No.(s): GCN-01-31; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The variability of the horizontal circulation in the stratosphere and troposphere of the Northern Hemisphere (NH) is compared by using various approaches. Spatial degrees of freedom (dof) on different time scales were derived. Modes of variability were computed in geopotential height fields at the tropospheric and stratospheric pressure levels by applying multivariate statistical approaches. Features of the spatial and temporal variability of the wintery zonal wind were studied with the help of recurrence and persistence analyses. The geopotential height and zonally-averaged zonal wind at the 50-, 500- and 1000-hPa level are used to investigate the behavior of the horizontal circulation in the lower stratosphere, mid-troposphere and at the near surface level, respectively. It is illustrated that the features of the variability of the horizontal circulation are very similar in the mid-troposphere and at the near surface level. Due to the filtering of tropospheric disturbances by the stratospheric and upper tropospheric zonal mean flow, the variability of the stratospheric circulation exhibits less spatial complexity than the circulation at tropospheric pressure levels. There exist enormous differences in the number of degrees of freedom (or free variability modes) between both atmospheric layers. Results of the analyses clearly show that the concept of a zonally symmetric AO with a simple structure in the troposphere similar to the one in the stratosphere is not valid. It is concluded that the spatially filtered climate change signal can be detected earlier in the stratosphere than in the mid-troposphere or at the near surface level.

Author

Atmospheric Circulation; Atmospheric Stratification; Degrees of Freedom; Geopotential Height; Stratosphere; Troposphere; Wind (Meteorology)

20010084310 NASA Goddard Space Flight Center, Greenbelt, MD USA

Mixing in the Extratropical Stratosphere: Model-measurements Comparisons using MLM Diagnostics

Ma, Jun, Johns Hopkins Univ., USA; Waugh, Darryn W., Johns Hopkins Univ., USA; Douglass, Anne R., NASA Goddard Space Flight Center, USA; Kawa, Stephan R., NASA Goddard Space Flight Center, USA; [2001]; 46p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We evaluate transport processes in the extratropical lower stratosphere for both models and measurements with the help of equivalent length diagnostic from the modified Lagrangian-mean (MLM) analysis. This diagnostic is used to compare measurements of long-lived tracers made by the Cryogenic Limb Array Etalon Spectrometer (CLAES) on the Upper Atmosphere Research Satellite (UARS) with simulated tracers. Simulations are produced in Chemical and Transport Models (CTMs), in which meteorological fields are taken from the Goddard Earth Observing System Data Assimilation System (GEOS DAS), the Middle Atmosphere Community Climate Model (MACCM2), and the Geophysical Fluid Dynamics Laboratory (GFDL) "SKYHI" model, respectively. Time series of isentropic equivalent length show that these models are able to capture major mixing and transport properties observed by CLAES, such as the formation and destruction of polar barriers, the presence of surf zones in both hemispheres. Differences between each model simulation and the observation are examined in light of model performance. Among these differences, only the simulation driven by GEOS DAS shows one case of the "top-down" destruction of the Antarctic polar vortex, as observed in the CLAES data. Additional experiments of isentropic advection of artificial tracer by GEOS DAS winds suggest that diabatic movement might have considerable contribution to the equivalent length field in the 3D CTM diagnostics.

Author

Atmospheric Models; Fluid Dynamics; Lagrangian Function; Stratosphere; Atmospheric Conductivity; Thermal Conductivity; Atmospheric Stratification; Advection; Mixing; Models

20010084311 Hampton Univ., Dept. of Physics, VA USA

Development of a Portable, Ground-based Ozone Lidar Instrument for Tropospheric Ozone Research and Educational Training Final Report, 1 Jul. 1997 - 30 Jun. 1999

Chyba, Thomas, Hampton Univ., USA; Zemker, Thomas, Hampton Univ., USA; [1999]; 27p; In English

Contract(s)/Grant(s): NCC1-251; NAG1-1949; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this research project is to develop a portable, eye-safe, ground-based ozone lidar instrument specialized for ozone differential absorption lidar (DIAL) measurements in the troposphere. This research project directly supports the goal of NASA's Earth Science Enterprise to understand the distribution and budget of tropospheric ozone (objective 1.5 of the Earth Science Strategic Enterprise Plan, 1998-2002). It can participate in ground validation experiments for TES, a tropospheric ozone satellite mission due to be launched in 2002. It can also be utilized for correlative ground measurements in future GTE (Global

Tropospheric Experiment) and space-based ozone lidar missions, such as ORACLE. Multiple ground-based ozone lidar systems would improve the data obtained through current ozone-sonde networks. This prototype instrument could serve as the basic unit for these and other future monitoring projects requiring multi-instrument networks, such as that proposed for the Global Tropospheric Ozone Project (GTOP). GTOP is currently being formulated by a scientific panel of the International Global Atmospheric Chemistry Project to meet its goal to better understand the processes that control the global distribution of tropospheric ozone. In order for the lidar to be widely deployed in networks, it must be fairly easy to use and maintain as well as being cost-competitive with a ground station launching ozonesondes several times a day. A second 2-year grant to continue this effort with students participating in ground tests and system improvements has been awarded by the Office of Equal Employment Opportunities (OEOP). This project also supports existing NASA lidar missions through its development of advanced, compact lidar technology. Innovations in both transmitters and receivers have been made in this project. Finally, this system could be modified in the future to probe more deeply into the stratosphere. This could be accomplished by increasing the emitted energy or optimizing the wavelengths for this purpose. In addition to NASA, this system has applications to the EPA, NOAA, and the DOD. An AFOSR grant has been awarded based on the results of this effort to fund advanced transmitter development at medium (20-40 mJ) energies. A second proposal to the DOD with a letter of support from Air Force Research Laboratory, has been submitted to extend this uv laser technology to 100 mJ levels. Thus, this project has enabled students and faculty at Hampton University to begin to develop research efforts in support of the mission of the DOD. This instrument will be based at Hampton University (HU) to meet our educational goal to train students in lidar technology as well as atmospheric ozone data analysis and interpretation. It will be also available for off-site measurement campaigns and will serve as a test bed for further instrument development. Later development beyond this grant to extend the scientific usefulness of the instrument may include incorporation of an aerosol channel and upgrading the laser to make stratospheric ozone measurements. Seven undergraduates, three graduate students, and one postdoctoral researcher (formerly an HU student) have been active participants in this research effort.

Author

Absorption Spectroscopy; Atmospheric Chemistry; Atmospheric Composition; Differential Absorption Lidar; Laser Applications; Lasers; Optical Radar; Ozone; Stratosphere; Troposphere; Education

20010084312 Search for Extraterrestrial Intelligence Inst., CA USA

Mineralogical and Geochemical Analyses of Antarctic Lake Sediments: A Reflectance and Moessbauer Spectroscopy Study with Applications for Remote Sensing on Mars

Froeschl, Heinz, Arsenal Research, Austria; Lougear, Andre, Medical Univ., Germany; Trautwein, Alfred X., Medical Univ., Germany; Newton, Jason, Tokyo Univ., Japan; Doran, Peter T., Illinois Univ., USA; Koerner, Wilfried, Wien Univ., Austria; Koeberl, Christian, Wien Univ., Austria; Mar. 07, 2000; 1p; In English

Contract(s)/Grant(s): NCC2-1100; RTOP 344-34-00-02; No Copyright; Avail: Issuing Activity; Abstract Only

Lakebottom sediments from the Dry Valleys region of Antarctica have been analyzed here in order to study the influence of water chemistry on the mineralogy and geochemistry of these sediments, as well as to evaluate techniques for remote spectral identification of potential biomarker minerals on Mars. Lakes from the Dry Valleys region of Antarctica have been investigated as possible analogs for extinct lake environments on early Mars. Sediment cores were collected in the present study from perennially ice-covered Lake Hoare in the Taylor Valley. These sediments were taken from a core in an oxic region of the lake and another core in an anoxic zone. Differences between the two cores were observed in the sediment color, Fe(II)/Fe(III) ratio, the presence of pyrite, the abundance of Fe, S and some trace elements, and the C, N and S isotope fractionation patterns. The results of visible-infrared reflectance spectroscopy (0.3-25 microns) Mossbauer spectroscopy (77 and 4 K) and X-ray diffraction are combined to determine the mineralogy and composition of these samples. The sediments are dominated by plagioclase, K-feldspar, quartz and pyroxene. Algal mats grow on the bottom of the lake and organic material has been found throughout the cores. Calcite is abundant in some layers of the aerobic core (shallow region) and pyrite is abundant in some layers of the anaerobic core (deep region). Analysis of the spectroscopic features due to organics and carbonates with respect to the abundance of organic C and carbonate contents was performed in order to select optimal spectral bands for remote identification of these components in planetary regoliths. Carbonate bands near 4 and 6.8 microns (approx.2500 and 1500/cm) were detected for carbonate abundances as low as 0.1 wt.% CO₂. Organic features at 3.38, 3.42 and 3.51 microns (2960, 2925 and 2850/cm) were detected for organic C abundances as low as 0.06 wt.% C. The d13C trends show a more complex organic history for the anaerobic sediments than for the aerobic sediments. The biogenic pyrite found in the anaerobic core is associated with lighter d34S values and high organic C levels and could be used as a biomarker mineral for paleolakes on Mars.

Author

Sediments; Antarctic Regions; Mineralogy; Mossbauer Effect; Infrared Spectroscopy; Remote Sensing; Carbonates

20010084626 NASA Marshall Space Flight Center, Huntsville, AL USA

The Storm-Time Plasmasphere by IMAGE/EUV

Gallagher, D. L., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Geospace Environment Modeling Conference, 17-22 Jun. 2001, Snowmass, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

With the availability of routine global images of the plasmasphere from the IMAGE Mission Extreme Ultraviolet Imager (EUV), we now have a growing body of observations that both characterize and quantify the dynamics of the plasmasphere. Direct interactions of the plasmasphere with the ring current and indirect interaction through localized electric fields appear to be the cause of a complex array of structures in the spatial distribution of thermal plasma. This presentation will show those features in detail and discuss possible mechanisms for their cause.

Author

Plasmasphere; Extreme Ultraviolet Radiation; Storms; Electric Fields; Imaging Techniques

20010084725 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA

Electron Temperature and Density at High Latitude

Kletzing, C. A., Iowa Univ., USA; Mozer, F. S., California Univ., USA; Torbert, R. B., New Hampshire Univ., USA; Journal of Geophysical Research; Jul. 01, 1998; ISSN 0148-0227; Volume 103, No. A7, pp. 14,837-14,845; In English

Contract(s)/Grant(s): NAG5-4518

Report No.(s): Paper-98JA00962; Copyright; Avail: Issuing Activity

The background electron temperature and density at altitudes between 1000 and 8000 km at invariant latitudes greater than 60 degrees have been determined from swept Langmuir probe measurements from the S3-3 satellite. These plasma parameters are determined by fitting the measured probe current-voltage relation to the expected theoretical response. Statistically acceptable fits are found for approx. 20% of all measurements and do not include measurements within the auroral density cavity. The results indicate that the density varies as an inverse power law with increasing altitude which has a typical value of 10 per cubic centimeters at 8000 km in altitude. The electron temperature shows a slight increase with altitude but is less than 5 eV for almost all measurements. These results suggest that the background plasma outside of auroral density cavities on high-latitude field lines below 8000 km is dominated by cold plasma of ionospheric origin which is at least an order of magnitude more dense than hotter magnetospheric components.

Author

Electron Density (Concentration); Electrostatic Probes; Polar Regions; Auroras; Statistical Analysis

20010084727 NASA Ames Research Center, Moffett Field, CA USA

Consensus Assignments for Water Vapor Lines Not Assigned on the HITRAN Database: 13,200 to 16,500/cm

Giver, Lawrence P., NASA Ames Research Center, USA; Chackerian, Charles, Jr., NASA Ames Research Center, USA; Freedman, Richard S., NASA Ames Research Center, USA; Varanasi, Prasad, NASA Ames Research Center, USA; [2000]; 1p; In English; HITRAN Conference, June 2000, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

There are nearly 800 water Vapor-lines in the 13,200-16,500/cm region that do not have rovibrational assignments in the HITRAN database. The positions and intensities in the database were determined by Mandin et al., but assignments could not be determined at that time. Polyansky, et al. have now assigned over 600 of the unassigned lines in the 11,200-16,500/cm region. Schwenke has also given rovibrational assignments to many of these unassigned lines throughout the visible and near-infrared. Both articles changed the assignments of some HITRAN lines. Carleer et al. extend assignments to some weaker lines measured by them on new spectra with excellent signal/noise. However, some lines measured by Mandin et al. were omitted by Carleer, et al. because of blends due to lower spectral resolution. The rovibrational assignments of Polyansky et al. completely agree with those in Schwenke's article for only about 200 lines. However, Schwenke's ab initio line list is available on his internet site (<http://ccf.arc.nasa.gov/-dschwenke>). A detailed comparison of the Polyansky et al. line list, the Carleer et al. line list, and Schwenke's ab initio line list shows a larger number of agreements. In many cases the disagreement is only about the vibrational and/or rotational upper level, while there is agreement on the lower state assignment and energy level, "E", which is of primary importance for atmospheric applications. We will present a line list of "consensus" assignments in the 13,200-16,500/cm region for consideration of inclusion on the HITRAN and GEISA databases. This will substantially reduce the number of unassigned lines on the databases in this spectral region.

Author

Water Vapor; Signal to Noise Ratios; Energy Levels; Energy Spectra; Vibration

20010084728 NASA Ames Research Center, Moffett Field, CA USA

Microphysical Modelling of Polar Stratospheric Clouds During the 1999-2000 Winter

Drdla, Katja, NASA Ames Research Center, USA; Schoeberl, Mark, NASA Ames Research Center, USA; Rosenfield, Joan, NASA Ames Research Center, USA; [2000]; 1p; In English; AGU Spring Meeting, 30 May - 3 Jun. 2000, Washington, DC, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The evolution of the 1999-2000 Arctic winter has been examined using a microphysical/photochemical model run along diabatic trajectories. A large number of trajectories have been generated, filling the vortex throughout the region of polar stratospheric cloud (PSC) formation, and extending from November until the vortex breakup, in order to provide representative sampling of the evolution of PSCs and their effect on stratospheric chemistry. The 1999-2000 winter was particularly cold, allowing extensive PSC formation. Many trajectories have ten-day periods continuously below the Type I PSC threshold; significant periods of Type II PSCs are also indicated. The model has been used to test the extent and severity of denitrification and dehydration predicted using a range of different microphysical schemes. Scenarios in which freezing only occurs below the ice frost point (causing explicit coupling of denitrification and dehydration) have been tested, as well as scenarios with partial freezing at warmer temperatures (in which denitrification can occur independently of dehydration). The sensitivity to parameters such as aerosol freezing rates and heterogeneous freezing have been explored. Several scenarios cause sufficient denitrification to affect chlorine partitioning, and in turn, model-predicted ozone depletion, demonstrating that an improved understanding of the microphysics responsible for denitrification is necessary for understanding ozone loss rates.

Author

Photochemical Reactions; Stratosphere; Atmospheric Chemistry; Ice Clouds; Polar Meteorology; Trajectories; Denitrogenation

20010085780 NASA Ames Research Center, Moffett Field, CA USA

Satellite Observations of Tropospheric Chemistry

Singh, Hanwant B., NASA Ames Research Center, USA; Jacob, Daniel J., Harvard Univ., USA; [2000]; 6p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The troposphere is an essential component of the earth's life support system as well as the gateway for the exchange of chemicals between different geochemical reservoirs of the earth. The chemistry of the troposphere is sensitive to perturbation from a wide range of natural phenomena and human activities. The societal concern has been greatly enhanced in recent decades due to ever increasing pressures of population growth and industrialization. Chemical changes within the troposphere control a vast array of processes that impact human health, the biosphere, and climate. A main goal of tropospheric chemistry research is to measure and understand the response of atmospheric composition to natural and anthropogenic perturbations, and to develop the capability to predict future change. Atmospheric chemistry measurements are extremely challenging due to the low concentrations of critical species and the vast scales over which the observations must be made. Available tropospheric data are mainly from surface sites and aircraft missions. Because of the limited temporal extent of aircraft observations, we have very limited information on tropospheric composition above the surface. This situation can be contrasted to the stratosphere, where satellites have provided critical and detailed chemical data on the global distribution of key trace gases.

Derived from text

Atmospheric Chemistry; Atmospheric Composition; Satellite Observation; Troposphere

20010085854 State Univ. of New York, Albany, NY USA

Case Study Investigations of Large-Amplitude Inertia-Gravity Wave Environments and Mesoscale Structures Final Report, 1 Jul. 1998 - 30 Jun. 2001

Bosart, Lance F., Albany Univ., USA; [2001]; 6p; In English

Contract(s)/Grant(s): NAG5-7469; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The research effort supported by NASA Grant NAG5-7469, awarded to the University at Albany, State University of New York (UA/SUNY), comprises the following two projects: (1) the observational study of large-amplitude inertia-gravity wave environments over the continental USA; and (2) the definition of opportunities and issues in extratropical cyclone dynamics and related phenomenological studies that may be addressed using high-resolution global datasets produced by the Data Assimilation Office (DAO) at the NASA/Goddard Space Flight Center.

Author

Cyclones; Gravity Waves; Inertia; Mesoscale Phenomena

20010085857 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

On the Air-Sea Coupling in the WAM Wave Model

Doortmont, D. F., Royal Netherlands Meteorological Inst., Netherlands; Makin, V. K., Royal Netherlands Meteorological Inst., Netherlands; 2000; ISSN 0169-1651; 64p; In English; Original contains color illustrations

Contract(s)/Grant(s): ENV4-CT97-0460

Report No.(s): KNMI-WR-2000-02; ISBN 90-369-2174-0; Copyright; Avail: Issuing Activity

Wind generates waves on the surface of the ocean. Modifications of the sea state influence the wind profile just above it. The current WAM wave model, Cycle 4, incorporates the coupling back of the waves to the wind by modifying the Charnock constant by a coupling parameter defined as the ratio of the wave-induced stress to the total momentum flux. Shortcomings of the numerical implementation of the coupling are discussed. This coupling module is compared to one using a fixed Charnock constant which is shown to produce equally accurate significant wave heights. An alternative air-sea coupling parameterization is put forward, replacing the present wind input source function in the WAM model. It uses recently developed physics to calculate the momentum fluxes directly, without applying a Charnock type relation. A more accurate pre-described high-frequency tail of the wave spectrum is used to calculate the wave-induced stress. An iterative parameter tuning method is presented to estimate control parameters occurring in the air-sea coupling modules. It minimizes a cost-function representing the modelling error using a finite difference approach together with the Levenberg-Marquardt optimization method. Model experiments are performed for the North Sea to tune, validate and intercompare the alternative wind-wave coupling parameterizations in the WAM model. The impact on calculated wave parameters like significant wave height is studied.

Derived from text

Water Waves; Air Water Interactions; Mathematical Models; Finite Difference Theory; Parameterization; Errors

20010085930 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Validation and Characterization of Ionospheric Densities Measured by DMSP

Keyser, Herbert L.; Mar. 2001; 136p; In English

Report No.(s): AD-A392481; AFIT/GAP/ENP/01M-05; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Future models of the thermosphere-ionosphere-magnetosphere system will require near real-time assimilation of ionospheric parameters to specify and forecast these regions. One of the current sensors that will be used in the GAIM model is the DMSP SSIES. Knowledge of the SSIES's reliability and data characteristics is key to using the data when relying on automated processes to ingest the data. To validate the DMSP value, the DMSP-measured density is compared to ground-based ISR measurements from solar minimum to solar maximum. The DMSP data are compared to data from the ISRs located at the Millstone Hill Observatory in Massachusetts and Sondrestrom in Greenland. The DMSP was found to measure densities 10 percent - 20 percent lower than Millstone Hill and 90 percent lower than Sondrestrom, however both were within the uncertainties of the ISR measurements. The DMSP data over Millstone Hill were analyzed for variability. After de-trending the data, the variability was found to range from 0.2 percent in geomagnetically quiescent periods to over 20 percent during active periods.

DTIC

Atmospheric Density; DMSP Satellites; Satellite Observation; Real Time Operation; Ionospheres; Ionospheric Sounding

20010086227 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Tunable Far Infrared Studies in Support of Stratospheric Measurements Final Report, 1 Jun. 1997 - 30 Apr. 2001

Chance, Kelly V., Smithsonian Astrophysical Observatory, USA; Park, K., Oregon Univ., USA; Nolt, I. G., NASA Langley Research Center, USA; Evenson, K. M., National Inst. of Standards and Technology, USA; August 2001; 14p; In English

Contract(s)/Grant(s): NAG5-4653; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes research done under NASA Grant NAG5-4653. The research performed under this grant has been a collaboration between institutions including the Smithsonian Astrophysical Observatory, the National Institute of Standards and Technology, the University of Oregon, and the NASA Langley Research Center. The program has included fully line-resolved measurements of submillimeter and far infrared spectroscopic line parameters (pressure broadening coefficients and their temperature dependences, and line positions) for the analysis of field measurements of stratospheric constituents, far infrared database improvements, and studies for improved satellite measurements of the Earth's atmosphere. This research program is designed to enable the full utilization of spectra obtained in far infrared/submillimeter field measurements, such as FIRS-2, FILOS, IBEX, SLS, EOSMLS, and proposed European Space Agency measurements of OH (e.g., PIRAMHYD and SFINX) for the retrieval of accurate stratospheric altitude profiles of key trace gases involved in ozone layer photochemistry. For the analysis of the spectra obtained in the stratosphere from far infrared measurements it is necessary to have accurate values of the molecular parameters (line positions, strengths, and pressure broadening coefficients) for the measured molecules and for possible interfering species. Knowledge of line positions is in increasingly good shape, with some notable exceptions. The increase in

position information includes research that has been performed in the present program of research on HO₂, H₂O, H₂O₂, O₃, HCl, HF, HBr, HI, CO, OH, and ClO. Examples where further line position studies are necessary include hot band and minor isotopomer lines of some of the major trace species (H₂O, O₃) and normal lines of some triatomic and larger molecules (NO₂). Knowledge of strengths is in generally good shape, since most of the lines are from electric dipole transitions whose intensities are well determined from Stark effect measurements; exceptions include some molecules with large vibration-rotation interactions (NO₂) and internal motions (H₂O₂ above the lowest torsional state). The line parameters that are still the least well determined are pressure broadening coefficients, and their temperature coefficients. These are strongly dependent on the quantum states involved in the transitions, in a way that is much more complex than the simple projection by directional cosine matrix elements involved in determination of rotational line strengths from static dipole moments. The following molecules have now been measured or detected in the atmosphere using far infrared and millimeter-wave emission spectroscopy from balloon- and satellite-borne spectrometers: OH, HO₂, H₂O (including minor isotopomers and hot band lines), H₂O₂, O₃P, O₂ (including minor isotopomers), O₃ (including minor isotopomers and hot band lines), HOCl, HCl, HF, HBr, ClO, CO, CO₂, N₂O, NO₂, N₂O₅, HNO₃, ClNO₃, and HCN. Many of these species have spectral lines that are saturated in stratospheric spectra. In these cases, the measured line equivalent widths are proportional to (line strength x Lorentz width) (exp 1/2) so that the pressure broadening coefficients are as important as the line intensities in determining concentration profiles. Interpretation of field measurements for these species have required ongoing measurement programs of pressure broadening measurements. Other species (HO₂, HGCl, H₂O₂, HBr, and NO₂, as examples) have required further line position studies in order to fully analyze the field measurements.

Derived from text

Infrared Spectroscopy; Stratosphere; Far Infrared Radiation; Atmospheric Composition; Absorption Spectra; Emission Spectra; Spectrum Analysis; Submillimeter Waves; Trace Elements; Molecules; Atmospheric Sounding; Line Spectra

20010087013 NASA Ames Research Center, Moffett Field, CA USA

Methanogenesis, Mesospheric Clouds, and Global Habitability

Pueschel, Rudolf F., NASA Ames Research Center, USA; [2000]; 1p; In English; Astrobiology Conference, 3-5 Apr. 2000, Moffett Field, CA, USA

Contract(s)/Grant(s): RTOP 622-65-08-10; No Copyright; Avail: Issuing Activity; Abstract Only

Hyperthermophilic methanogens can exist in a deep hot biosphere up to 110 C, or 10 km deep. Methane (CH₄) itself is thermodynamically stable to depths of 300 km. Geologic (microbial plus abiogenic thermal) methane is transported upward, attested to by its association with helium, to form petroleum pools. Near or at the surface, geologic CH₄ mixes with other natural and with anthropogenic CH₄ yielding annual emissions into the atmosphere of 500 Tg, of which 200 Tg are natural and 300 Tg are man-made. The atmospheric lifetime of CH₄, a greenhouse gas 20 times more effective than CO₂ in raising global temperatures, is approximately 10 years. It is removed from the atmosphere mainly by reactions with hydroxyl radical (OH) to form CO₂, but also by dry soil and by conversion to H₂O in the stratosphere and middle atmosphere. A sudden rise in atmospheric temperatures by 9-12 C some 55 million years ago has been explained by the release in a few thousand years of three trillion tons of CH₄ out of 15 trillion tons that had formed beneath the sea floor. What prevented this CH₄-induced greenhouse effect from running away? An analog to the CH₄-burp of 55 million years ago is the CH₄-doubling over the past century which resulted in a increase in upper level H₂O from 4.3 ppmv to 6 ppmv. This 30% increase in H₂O vapor yielded a tenfold increase in brightness of polar mesospheric clouds because of a strong dependence of the ice particle nucleation rate on the water saturation ratios. Models show that at a given temperature the optical depth of mesospheric clouds scales as [H₂O]^{beta} with beta varying between 4 and 8. Radiative transfer tools applied to mesospheric particles suggest that an optical depth of approximately one, or 1000 times the current mesospheric cloud optical depth, would result in tropospheric cooling of about 10 K. Assuming beta=6, a thousandfold increase in optical thickness would require a three-fold increase of H₂O, or a 20-fold increase of CH₄. At the current rate of anthropogenic emissions this is expected to occur within the next 1000 years. This timescale is also commensurate with what has been assumed for the CH₄- burp 55 million years ago.

Author

Mesosphere; Methane; Clouds (Meteorology); Biosphere; Thermophiles

20010087777 Los Alamos National Lab., NM USA

Probing Near-Surface Atmospheric Turbulence with Lidar Measurements and High-Resolution Hydrodynamic Models

Kao, J.; Cooper, D.; Reisner, J.; Eichinger, W.; 2001; 16p; In English

Report No.(s): DE2001-768178; LA-UR-00-4019; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

As lidar technology is able to provide fast data collection at a resolution of meters in an atmospheric volume, it is imperative to promote a modeling counterpart of the Lidar capability. This paper describes an integrated capability based on data from a scanning water vapor Lidar and a high-resolution hydrodynamic model (HIGRAD) equipped with a visualization routine

(VLEWER) that simulates the lidar scanning. The purpose is to better understand the spatial and temporal representativeness of the lidar measurements and, in turn to extend their utility in studying turbulence fields in the atmospheric boundary layer. Raman Lidar water vapor data collected over the Pacific warm pool and the simulations with the HIGRAD code are used for identifying the underlying physics and potential aliasing effects of spatially resolved lidar measurements. This capability also helps improve the trade-off between spatial-temporal resolution and coverage of the Lidar measurements.

NTIS

Atmospheric Turbulence; Optical Radar; Radar Measurement

20010088171 Atmospheric Systems and Analysis, Westminster, CO USA

Structure and Variability of Water Vapor in the Upper Troposphere and Lower Stratosphere *Progress Report*

Salby, Murry L., Atmospheric Systems and Analysis, USA; Mar. 01, 2001; 3p; In English

Contract(s)/Grant(s): NAG5-6692; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Upper-tropospheric humidity (UTH) has been synoptically mapped via an algorithm that rejects small-scale undersampled variance, which is intrinsic to asymptotic measurements of water vapor, cloud, and other convective properties. Mapped distributions of UTH have been used, jointly with high-resolution Global Cloud Imagery (GCI), to study how the upper troposphere is humidified. The time-mean distribution of UTH is spatially correlated to the time-mean distribution of cold cloud fraction (η) (T is less than 230 K). Regions of large UTH coincide with regions of large η , which mark deep convection. They also coincide with regions of reduced vertical stability, in which the vertical gradient of θ is weakened by convective mixing. Coldest cloud cover is attended convective overshoots above the local tropopause, which is simultaneously coldest and highest. Together, these features reflect the upper-troposphere being ventilated by convection, which mixes in moist air from lower levels. Histograms of UTH and η have been applied to construct the joint probability density function, which quantifies the relationship between these properties. The expected value of UTH in convective regions is strongly correlated to the expected value of η . In ensembles of asymptotic samples, the correlation between ϵ [UTH] and ϵ [η] exceeds 0.80. As these expectations reflect the most likely values, the strong correlation between ϵ [UTH] and ϵ [η] indicates that the large-scale organization of UTH is strongly shaped by convective pumping of moisture from lower levels. The same relationship holds for unsteady fields - even though, instantaneously, those fields are comprised almost entirely of small-scale convective structure. The spatial autocorrelation of UTH, constructed at high resolution from overpass data along ascending and descending tracks of the orbit, is limited to only a couple of degrees in the horizontal. This mirrors the spatial autocorrelation of η , which likewise operates coherently on short scales. The short correlation scale of UTH, which reflects the scale of individual convective systems, is comparable to the spacing of retrievals from MLS. These scales are undersampled in the synoptic measurements. Despite their prevalence, the mapping algorithm described above successfully recovers synoptic behavior operating coherently on large scales. It reveals eastward migration of anomalous UTH from the Indian ocean to the central Pacific, in association with the modulation of convection by the Madden-Julian oscillation. Additional information is contained in the original extended abstract.

Derived from text

Stratosphere; Troposphere; Water Vapor; Synoptic Meteorology; Clouds (Meteorology); Free Convection; Humidity Measurement

20010088242 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA

Validation and Assessment of DMSP Electron Temperatures in the Topside Ionosphere

Green, Bradford S.; Mar. 2001; 113p; In English

Report No.(s): AD-A392676; AFIT/GAP/ENP/01M-03; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

Geomagnetic disturbances in the near earth space environment can adversely affect numerous military and Department of Defense (DoD) systems and operations. To improve the prediction accuracy of such disturbances, the next generation of space environment forecast models aims to automatically ingest real-time ionospheric measurements. This research validates and assesses one such measurement - the Defense Military Satellite Program (DMSP) measured electron temperature (T_e). DMSP T_e data were validated against near simultaneous incoherent scatter radar (ISR) T_e measurements from Millstone Hill, MA and Sondrestrom, Greenland between Winter 1996 and Summer 2000. Of the 37 Millstone and six Sondrestrom conjunctions compared, DMSP T_e values exceeded ISR T_e values by an average of about 25 percent, which is nearly three times the mean ISR uncertainty. DMSP vs. ISR T_e percent differences were smallest during solar maximum, increasing towards solar minimum, likely due to photoelectron influence on DMSP T_e measurements. In some cases, instrument related anomalies produced unreliable measurements. Based on an assumed linear T_e behavior at mid latitudes, the average DMSP T_e random noise level above Millstone Hill was estimated at about four percent, falling well within the

published T(sub e) measurement accuracy. A more comprehensive comparison extending to other sectors of the DMSP orbit is required to further validate the root cause of the DMSP T(sub e), - ISR T(sub e) offset.

DTIC

Aerospace Environments; Electron Energy; Radar Measurement; Defense Program; Ionospheric; Environment Models; Magnetic Disturbances

20010088371 Atmospheric and Environmental Research, Inc., Lexington, MA USA

Comparison of ER-2 Aircraft and POAM-III, MLS, and SAGE-II Satellite Measurements During SOLVE Using Traditional Correlative Analysis and Trajectory Hunting Technique *Final Report*

Danilin, M. Y., Atmospheric and Environmental Research, Inc., USA; Ko, Malcolm K. W., Atmospheric and Environmental Research, Inc., USA; Bevilacqua, R. M., Naval Research Lab., USA; Lyjak, L. V., National Center for Atmospheric Research, USA; Froidevaux, L., Jet Propulsion Lab., California Inst. of Tech., USA; Santee, M. L., Jet Propulsion Lab., California Inst. of Tech., USA; Zawodny, J. M., NASA Langley Research Center, USA; Hoppel, K. W., Naval Research Lab., USA; Richard, E. C., National Oceanic and Atmospheric Administration, USA; Spackman, J. R., Harvard Univ., USA; [2001]; 34p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS5-98131; NAS5-97039; NASA Order S-10109-X; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We compared the version 5 Microwave Limb Sounder (MLS) aboard the Upper Atmosphere Research Satellite (UARS), version 3 Polar Ozone and Aerosol Measurement-III (POAM-III) aboard the French satellite SPOT-IV, version 6.0 Stratospheric Aerosol and Gas Experiment 11 (SAGE-II) aboard the Earth Radiation Budget Satellite, and NASA ER-2 aircraft measurements made in the northern hemisphere in January-February 2000 during the SAGE III Ozone Loss and Validation Experiment (SOLVE). This study addresses one of the key scientific objectives of the SOLVE campaign, namely, to validate multi-platform satellite measurements made in the polar stratosphere during winter. This intercomparison was performed using a traditional correlative analysis (TCA) and a trajectory hunting technique (THT). Launching backward and forward trajectories from the points of measurement, the THT identifies air parcels sampled at least twice within a prescribed match criterion during the course of 5 days. We found that the ozone measurements made by these four instruments agree most of the time within 110% in the stratosphere up to 1400 K (approximately 35 km). The water vapor measurements from POAM-III and the ER-2 Harvard Lyman-alpha hygrometer and JPL laser hygrometer agree to within 10.5 ppmv (or about +/-10%) in the lower stratosphere above 380 K. The MLS and ER-2 ClO measurements agree within their error bars for the TCA. The MLS and ER-2 nitric acid measurements near 17-20 km altitude agree within their uncertainties most of the time with a hint of a positive offset by MLS according to the TCA. We also applied the AER box model constrained by the ER-2 measurements for analysis of the ClO and HN03 measurements using the THT. We found that: (1) the model values of ClO are smaller by about 0.3-0.4 (0.2) ppbv below (above) 400 K than those by MLS and (2) the HN03 comparison shows a positive offset of MLS values by approximately 1 and 1-2 ppbv below 400 K and near 450 K, respectively. It is hard to quantify the HN03 offset in the 400-440 K range because of the high sensitivity of nitric acid to the PSC schemes. Our study shows that, with some limitations (like HN03 comparison under PSC conditions), the THT is a more powerful tool for validation studies than the TCA, making conclusions of the comparison statistically more robust.

Author

Satellite Observation; Stratosphere; Upper Atmosphere Research Satellite (UARS); U-2 Aircraft; Spot (French Satellite); Ozonometry; Nitric Acid; Water Vapor; Data Correlation; Particle Trajectories; Atmospheric Composition

20010088770 State Univ. of New York, Dept. of Geosciences, Stony Brook, NY USA

Crustal Heat Production and the Thermal Evolution of Mars

McLennan, Scott M., State Univ. of New York, USA; [2001]; 8p; In English

Contract(s)/Grant(s): NAG5-8169; NAG5-10583; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The chemical compositions of soils and rocks from the Pathfinder site and Phobos-2 orbital gamma-ray spectroscopy indicate that the Martian crust has a bulk composition equivalent to large-ion lithophile (LIL) and heat-producing element (HPE) enriched basalt, with a potassium content of about 0.5%. A variety of radiogenic isotopic data also suggest that separation of LIL-enriched crustal and depleted mantle reservoirs took place very early in Martian history (greater than 4.0 Ga). Accordingly, if the enriched Martian crust is greater than 30km thick it is likely that a large fraction (up to at least 50%) of the heat-producing elements in Mars was transferred into the crust very early in the planet's history. This would greatly diminish the possibility of early widespread melting of the Martian mantle.

Author

Mars Surface; Planetary Geology; Planetary Crusts; Planetary Mantles; Planetary Evolution; Plates (Tectonics); Chemical

Composition; Soils; Rocks; Structural Properties (Geology); Geological Faults

20010089374 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

Salmon's Hamiltonian Approach to Balanced Flow Applied to a One-Layer Isentropic Model of the Atmosphere

Verkley, W. T. M., Royal Netherlands Meteorological Inst., Netherlands; July 2000; ISSN 0169-1651; 32p; In English; Original contains color illustrations

Report No.(s): KNMI-WR-2000-03; ISBN 90-369-2177-5; Copyright; Avail: Issuing Activity

Salmon's Hamiltonian approach is applied to formulate a balanced approximation to a hydrostatic one-layer isentropic model of the atmosphere. The model, referred to as the parent model, describes an idealized atmosphere of which the dynamics is closely analogous to a one-layer shallow-water model on the sphere. The balance used as input in Salmon's approach is a simplified form of 'linear balance', in which the balanced velocity $v(\text{sub } b)$ is given by $v(\text{sub } b) = k \times \text{del-}f(\text{exp } -1) (M - M\text{-bar})$. Here k is a vertical unit vector, f is the Coriolis parameter, M is the Montgomery potential and $M\text{-bar}$ is the value of the Montgomery potential at the state of rest. This form of balance behaves acceptably on the whole sphere, in contrast with 'classic' geostrophic balance, $v(\text{sub } b) = k \times f(\text{exp } -1) \text{del-}M$, which forces the meridional wind velocity to be zero at the equator. Salmon's Hamiltonian approach is applied to obtain an equation for the time-change of the balanced velocity that guarantees both material conservation of potential vorticity as well as conservation of energy. New in this application of Salmon's approach is a nonlinear relation between Montgomery potential and surface pressure (characteristic for an isentropic ideal gas in hydrostatic equilibrium) in combination with spherical geometry and a variable Coriolis parameter. We will discuss how the unbalanced velocity $v(\text{sub } a)$ can be calculated in a practical way and how the model can be stepped forward in time by advecting the balanced potential vorticity with the sum of the balanced and unbalanced velocity. The balanced model is tested against a ten-day period from a long integration with the parent model.

Author

Hamiltonian Functions; Isentropic Processes; Atmospheric Models; Computerized Simulation

47

METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20010083355 Florida State Univ., Dept. of Meteorology, Tallahassee, FL USA

Numerical Simulations and Diagnostic Studies of Meteorological Conditions During PEM-Tropics B Final Report

Fuelberg, Henry E., Florida State Univ., USA; July 2001; 5p; In English

Contract(s)/Grant(s): NCC1-308

Report No.(s): FSU-1338-783-26; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Provides a final report on the work accomplished by several meteorological scientists under a NASA grant in conjunction with the DC-8 component of Pacific Exploratory Mission (PEM)-Tropics B. The responsibilities of the principal investigator included collaboration with the Science Team on flight planning, presentation of forecasts, and the preparation of map discussions for each flight. In a published manuscript, the principal investigator summarized the meteorological conditions during PEM-TB which included mean flow patterns, subtropical anticyclones, the South Pacific Convergence Zone (SPCZ), and the Intertropical Convergence Zone (ITCZ). Methodologies used included streamlines, ten day backward trajectories, thermodynamic soundings, and satellite imagery. Other interests included air sampling for the purpose of determining pollution levels.

CASI

Tropical Regions; Weather; Aviation Meteorology

20010083356 NASA Ames Research Center, Moffett Field, CA USA

Size Scales for Thermal Inhomogeneities in Mars' Atmosphere Surface Layer: Mars Pathfinder

Mihalov, John D., NASA Ames Research Center, USA; Haberle, Robert M., NASA Ames Research Center, USA; Seiff, Alvin, San Jose State Univ., USA; Murphy, James R., New Mexico State Univ., USA; Schofield, John T., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA

Contract(s)/Grant(s): RTOP 624-04-04; No Copyright; Avail: Issuing Activity; Abstract Only

Atmospheric temperature measurement at three heights with thin wire thermocouples on the 1.1 m Mars Pathfinder meteorology must allow estimates of the integral scale of the atmospheric thermal turbulence during an 83 sol period that begins in the summer. The integral scale is a measure for regions of perturbations. In turbulent media that roughly characterizes locations

where the perturbations are correlated. Excluding some to intervals with violent excursions of the mean temperatures, integral scale values are found that increase relatively rapidly from a few tenths meters or less near down to several meters by mid-morning. During mid-morning, the diurnal and shorter time scale wind direction variations often place the meteorology mast in the thermal wake of the Lander.

Author

Mars Atmosphere; Mars Pathfinder; Homogeneity; Wind (Meteorology)

20010083364 NASA Goddard Inst. for Space Studies, New York, NY USA

Satellite Remote Sensing of the Liquid Water Sensitivity in Water Clouds

Han, Qing-Yuan, Alabama Univ., USA; Rossow, William B., NASA Goddard Inst. for Space Studies, USA; Welch, Ronald, NASA Goddard Inst. for Space Studies, USA; Zeng, Jane; [2001]; 26p; In English; Original contains color illustrations

Contract(s)/Grant(s): NCC8-200; NAS1-98131; NAG5-7702

Report No.(s): GCN-01-23; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In estimation of the aerosol indirect effect, cloud liquid water path is considered either constant (Twomey effect) or increasing with enhanced droplet number concentrations (drizzle-suppression effect, or Albrecht effect) if cloud microphysics is the prevailing mechanism during the aerosol-cloud interactions. On the other hand, if cloud thermodynamics and dynamics are considered, the cloud liquid water path may be decreased with increasing droplet number concentration, which is predicted by model calculations and observed in ship-track and urban influence studies. This study is to examine the different responses of cloud liquid water path to changes of cloud droplet number concentration. Satellite data (January, April, July and October 1987) are used to retrieve the cloud liquid water sensitivity, defined as the changes of liquid water path versus changes of column droplet number concentrations. The results of a global survey reveal that 1) in at least one third of the cases the cloud liquid water sensitivity is negative, and the regional and seasonal variations of the negative liquid water sensitivity are consistent with other observations; 2) cloud droplet sizes are always inversely proportional to column droplet number concentrations. Our results suggest that an increase of cloud droplet number concentration leads to reduced cloud droplet size and enhanced evaporation, which weakens the coupling between water clouds and boundary layer in warm zones, decreases water supply from surface and desiccates cloud liquid water. Our results also suggest that the current evaluations of negative aerosol indirect forcing by global climate models (GCM), which are based on Twomey effect or Albrecht effect, may be overestimated.

Author

Aerosols; Cloud Physics; Drops (Liquids); Water; Atmospheric Effects; Clouds (Meteorology); Remote Sensing

20010084444 Naval Academy, Annapolis, MD USA

Determination of Atmospheric Density in Low-Earth Orbit Using GPS Data

Young, John L., III; May 07, 2001; 89p; In English

Report No.(s): AD-A392479; USNA-1531-2; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The objective of this project was to develop an algorithm to accurately determine atmospheric density using simulated GPS data. This algorithm is designed to Support a future USNA Small Satellite mission. Atmospheric density is the most variable factor in orbit propagation. Thus, the uncertainty in density generates the most error when predicting a satellite's future position. Numerous models have been developed to account for the variations, but more accurate models are needed. In developing the algorithm, Satellite Tool Kit (STK), Analytical Graphics Inc.'s orbit propagation software, was used to generate data using one of several atmospheric models. by measuring the changes in the satellite's orbit due to atmospheric drag, the density was accurately calculated to within 1% of the 1976 Standard Atmospheric Model. to validate the algorithm, the density Output was compared to that of the model used in STK. The USNA Small Satellite Program has planned to design and place a satellite in low-Earth orbit (LEO) with a GPS receiver on board. The primary mission of the satellite is to determine density in the upper atmosphere. Once the USNA satellite is on orbit, the algorithm can be used to create a database of densities. Other small satellite programs will launch similar satellites to generate sufficient data. With the new atmospheric density data, scientists can create an improved atmospheric model.

DTIC

Global Positioning System; Atmospheric Density; Atmospheric Models; Algorithms; Low Earth Orbits

20010084724 Meteorological Satellite Center, Kiyose, Japan

Monthly Report of the Meteorological Satellite Center: May 2001

May 2001; 2p; In English; CD-ROM conforms to the ISO 9660 standard for volume and file structure; Copyright; Avail: Issuing Activity

The CD-ROM concerning the May 2001 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.

Derived from text

Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20010084786 Forest Service, Communications Group, Portland, OR USA

MC1: A Dynamic Vegetation Model for Estimating the Distribution of Vegetation and Associated Ecosystem Fluxes of Carbon, Nutrients, and Water. Technical Documentation, 1.0

Bachelet, D.; Lenihan, J. M.; Daly, C.; Neilson, R. P.; Ojima, D. S.; Jun. 2001; 120p; In English

Report No.(s): PB2001-107674; FSGTR-PNW-508; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Assessments of vegetation response to climate change have generally been made only by equilibrium vegetation models that predict vegetation composition under steady-state conditions. These models do not simulate either ecosystem biogeochemical processes or changes in ecosystem structure that may, in turn, act as feedbacks in determining the dynamics of vegetation change. MC1 is a new dynamic global vegetation model created to assess potential impacts of global climate change on ecosystem structure and function at a wide range of spatial scales from landscape to global. This new tool allows the authors to incorporate transient dynamics and make real time predictions about the patterns of ecological change. MC1 was created by combining physiologically based biogeographic rules defined in the MAPSS model with a modified version of the biogeochemical model, CENTURY. MC1 also includes a fire module, MCFIRE that mechanistically simulates the occurrence and impacts of fire events.

NTIS

Ecosystems; Vegetation; Climate Change; Climatology; Biogeochemistry; Real Time Operation; Dynamic Models

20010084897 City Univ. of New York, Dept. of Physical, Environmental and Computer Sciences, Brooklyn, NY USA

Hand-Held Sunphotometers for High School Student Construction and Measuring Aerosol Optical Thickness

Almonor, Linda, City Univ. of New York, USA; Baldwin, C., City Univ. of New York, USA; Craig, R., City Univ. of New York, USA; Johnson, L. P., City Univ. of New York, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 33-36; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Science education is taking the teaching of science from a traditional (lecture) approach to a multidimensional sense-making approach which allows teachers to support students by providing exploratory experiences. Using projects is one way of providing students with opportunities to observe and participate in sense-making activity. We created a learning environment that fostered inquiry-based learning. Students were engaged in a variety of Inquiry activities that enabled them to work in cooperative planning teams where respect for each other was encouraged and their ability to grasp, transform and transfer information was enhanced. Summer, 1998: An air pollution workshop was conducted for high school students in the Medgar Evers College/Middle College High School Liberty Partnership Summer Program. Students learned the basics of meteorology: structure and composition of the atmosphere and the processes that cause weather. The highlight of this workshop was the building of hand-held sunphotometers, which measure the intensity of the sunlight striking the Earth. Summer, 1999: high school students conducted a research project which measured the mass and size of ambient particulates and enhanced our ability to observe through land based measurements changes in the optical depth of ambient aerosols over Brooklyn. Students used hand held Sunphotometers to collect data over a two week period and entered it into the NASA GISS database by way of the internet.

Author

Photometers; Optical Thickness; Aerosols; Sunlight; Students

20010085343 NASA Goddard Space Flight Center, Greenbelt, MD USA

Improving Global Modeling and Data Analysis Using Remotely-Sensed Rainfall Data: Lessons From TRMM and Plans for GPM

Hou, Arthur Y., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; MIT Atmospheric Science Seminar, 3 May 2001, Cambridge, MA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

I will discuss the need for accurate rainfall observations to improve our ability to model the earth's climate and improve short-range weather forecasts. I will give an overview of the recent progress in using of rainfall data provided by TRMM and other

microwave instruments in data assimilation to improve global analyses and diagnose state-dependent systematic errors in physical parameterizations. I will outline the current and future research strategies in preparation for the Global Precipitation Mission.

Author

Rain; Remote Sensing; Trmm Satellite; Climate Models; Data Acquisition

20010085367 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA

National Convective Weather Forecast (NCWF) 1999 Assessment Report

Sims, Danny, Federal Aviation Administration, USA; Fidalgo, Cynthia, Federal Aviation Administration, USA; Jun. 2001; 77p; In English; Original contains color plates

Report No.(s): AD-A392542; DOT/FAA/CT-TN00/23; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

The report summarizes the National Convective Weather Forecast (NCWF) 1999 Assessment conducted by ACT-320 at Comair and Delta Airlines from April through November 1999. The NCWF, developed by scientists at the National Center for Atmospheric Research (NCAR), combines radar information along with lightning data to produce a graphical convective detection field as well as 1- and 2-hour forecasts of convective weather. Feedback was collected from airline dispatchers and focused on the value, perceived benefit, and performance of the NCWF for airline dispatch use. The assessment demonstrated the utility of the NCWF for airline dispatch operations. However, further development should concentrate on improved accuracy of the forecasts. In addition, convective growth and decay capabilities should be incorporated.

DTIC

Weather Forecasting; Thunderstorms; Convection; Meteorological Parameters; Commercial Aircraft

20010085927 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

Rainfall Generator for the Meuse Basin: Simulation of 6-Hourly Rainfall and Temperature for the Ourthe Catchment

Wojcik, Rafal, Royal Netherlands Meteorological Inst., Netherlands; Buishand, T. Adri, Royal Netherlands Meteorological Inst., Netherlands; 2001; 36p; In English; Original contains color illustrations

Contract(s)/Grant(s): RI-2726; RI-3414

Report No.(s): KNMI-Publ-196-1; ISBN 90-369-2198-8; Copyright; Avail: Issuing Activity

This report presents a first study on the development of a stochastic weather generator for the Meuse basin which produces long-duration, multi-site time series of precipitation and temperature. By running these synthetic data through a hydrological/hydraulic model, it is expected to get a better insight into the likelihood of extreme river discharges in the Netherlands. This report is restricted to the Ourthe basin (3626 sq km). Time series of 6-hourly area-average precipitation of 3 sub-catchments (Ourthe upstream of Hamoir, Ambleve and Vesdre) and average 6-hourly temperature at St. Hubert are considered. Simulation is done by nearest-neighbour resampling. Because of the intended application, the performance of the method is only assessed for the winter half-year (October- March). It appears that straightforward resampling of the historical 6-hourly values does not adequately reproduce a number of second-order statistics of precipitation and temperature. Particularly, the slow decay of the autocorrelation function of 6-h area-average rainfall is not preserved. The standard deviations of monthly rainfall and the quantiles of the multi-day winter maximum precipitation amounts are therefore underestimated. As an alternative, simulation of daily values with disaggregation into 6-h values using the method of fragments is studied. With this strategy a reasonable reproduction of the second-order statistics of rainfall and temperature is achieved. Moreover, there is a good correspondence between the historical and simulated distributions of the winter maximum precipitation amounts.

Derived from text

Rain; Hydrology Models; Autocorrelation; Time Series Analysis; Simulation; Stochastic Processes

20010085945 NASA Goddard Space Flight Center, Greenbelt, MD USA

New Approaches For Validating Satellite Global Precipitation Measurements

Smith, Eric A., NASA Goddard Space Flight Center, USA; [2001]; 2p; In English; Annual Meeting of Korean Meteorological Society, 26-27 Apr. 2001, Seoul, Korea, Republic of; Sponsored by Korean Meteorological Society, Korea, Republic of; No Copyright; Avail: Issuing Activity; Abstract Only

The scientific successes of the Tropical Rainfall Measuring Mission (TRMM) and additional recent satellite-focused precipitation retrieval projects, particularly those based on use of passive microwave radiometer measurements, have paved the way for a more advanced mission currently under development as the Global Precipitation Measurement (GPM) mission. This new mission is motivated by a number of scientific questions that TRMM research has posed over a range of space-time scales and within a variety of scientific disciplines that are becoming more integrated into earth system science modeling.

Author

Earth Sciences; Precipitation (Meteorology); Trmm Satellite

20010086178 NASA Goddard Space Flight Center, Greenbelt, MD USA

Lower Stratospheric Temperature Differences Between Meteorological Analyses in two cold Arctic Winters and their Impact on Polar Processing Studies

Manney, Gloria L., Jet Propulsion Lab., California Inst. of Tech., USA; Sabutis, Joseph L., New Mexico Highlands Univ., USA; Pawson, Steven, NASA Goddard Space Flight Center, USA; Santee, Michelle L., NASA Goddard Space Flight Center, USA; Naujokat, Barbara, Freie Univ., Germany; Swinbank, Richard, Met Office, UK; Gelman, Melvyn E., National Oceanic and Atmospheric Administration, USA; Ebisuzaki, Wesley, National Oceanic and Atmospheric Administration, USA; [2001]; 33p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A quantitative intercomparison of six meteorological analyses is presented for the cold 1999-2000 and 1995-1996 Arctic winters. The impacts of using different analyzed temperatures in calculations of polar stratospheric cloud (PSC) formation potential, and of different winds in idealized trajectory-based temperature histories, are substantial. The area with temperatures below a PSC formation threshold commonly varies by approximately 25% among the analyses, with differences of over 50% at some times/locations. Freie University at Berlin analyses are often colder than others at T is less than or approximately 205 K. Biases between analyses vary from year to year; in January 2000, U.K. Met Office analyses were coldest and National Centers for Environmental Prediction (NCEP) analyses warmest, while NCEP analyses were usually coldest in 1995-1996 and Met Office or NCEP[National Center for Atmospheric Research Reanalysis (REAN)] warmest. European Centre for Medium Range Weather Forecasting (ECMWF) temperatures agreed better with other analyses in 1999-2000, after improvements in the assimilation model, than in 1995-1996. Case-studies of temperature histories show substantial differences using Met Office, NCEP, REAN and NASA Data Assimilation Office (DAO) analyses. In January 2000 (when a large cold region was centered in the polar vortex), qualitatively similar results were obtained for all analyses. However, in February 2000 (a much warmer period) and in January and February 1996 (comparably cold to January 2000 but with large cold regions near the polar vortex edge), distributions of "potential PSC lifetimes" and total time spent below a PSC formation threshold varied significantly among the analyses. Largest peaks in "PSC lifetime" distributions in January 2000 were at 4-6 and 11-14 days, while in the 1996 periods, they were at 1-3 days. Thus different meteorological conditions in comparably cold winters had a large impact on expectations for PSC formation and on the discrepancies between different meteorological analyses. Met Office, NCEP, REAN, ECMWF and DAO analyses are commonly used for trajectory calculations and in chemical transport models; the choice of which analysis to use can strongly influence the results of such studies.

Author

Atmospheric Temperature; Polar Meteorology; Stratosphere; Winter; Data Reduction; Arctic Regions; Ice Clouds; Ozone Depletion; Temperature Measurement; Comparison

20010086236 NASA Goddard Space Flight Center, Greenbelt, MD USA

Statistical Mining of Predictability of Seasonal Precipitation over the USA

Lau, William K. M., NASA Goddard Space Flight Center, USA; Kim, Kyu-Myong, Science Systems and Applications, Inc., USA; Shen, S. P., National Research Council; [2001]; 20p; In English; Sponsored in part by the National Research Council; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results from a new ensemble canonical correlation (ECC) prediction model yield a remarkable (10-20%) increases in baseline prediction skills for seasonal precipitation over the US for all seasons, compared to traditional statistical predictions. While the tropical Pacific, i.e., El Nino, contributes to the largest share of potential predictability in the southern tier States during boreal winter, the North Pacific and the North Atlantic are responsible for enhanced predictability in the northern Great Plains, Midwest and the southwest US during boreal summer. Most importantly, ECC significantly reduces the spring predictability barrier over the conterminous US, thereby raising the skill bar for dynamical predictions.

Author

Precipitation (Meteorology); Weather Forecasting; Mathematical Models

20010086425 Colorado State Univ., Fort Collins, CO USA

Alternative Methods for Specification of Observed Forcing in Single-Column Models and Cloud System Models

Randall, David A., Colorado State Univ., USA; Cripe, Douglas G., Colorado State Univ., USA; Journal of Geophysical Research; Oct. 27, 1999; ISSN 0148-0227; Volume 104, No. D20, pp. 24,527-24,545; In English; Original contains color illustrations Contract(s)/Grant(s): DE-FG02-92ER-61363

Report No.(s): Paper-1999JD900765; Copyright; Avail: Issuing Activity

We discuss alternative methods for prescribing advective tendencies in single column models (SCMs) and cloud system models. These include "revealed forcing," in which the total advective tendency is, prescribed from observations, "horizontal advective forcing," in which the horizontal advective tendencies are prescribed, together with the observed vertical motion which

is combined with the predicted sounding to determine the tendencies due to vertical advection; and relaxation forcing, in which the horizontal advective tendencies are computed by relaxing the sounding toward the observed upstream sounding, with a relaxation timescale determined by the time required for the wind to carry parcels across the grid column. When relaxation forcing is used, the horizontal advective tendencies can be diagnosed from the model output and compared with the corresponding observed tendencies. We present SCM results to illustrate these three forcing methods, based on data from several field experiments in both the tropics and the midlatitudes. Each method is shown to have its strengths and weaknesses. Overall, the results presented here do not show unambiguous differences between revealed forcing and horizontal advective forcing. The two methods appear to be generally comparable. Revealed forcing may therefore be preferred for its simplicity. Relaxation forcing guarantees realistic soundings of the state variables but can produce large errors in parameterized processes which are driven by rates (e.g., fluxes) rather than states. In particular, relaxation forcing gives large errors in the precipitation rate in this model. We demonstrate that relaxation forcing leads to unrealistically high (low) precipitation in versions of the model which tend to produce unrealistically dry (humid) soundings. The observed horizontal advective tendencies in the tropics are so weak, especially for temperature, that small absolute errors in the diabatic tendencies diagnosed with relaxation forcing can lead to large relative errors in the diagnosed horizontal advective tendencies.

Author

Advection; Clouds (Meteorology); Vertical Motion; Sounding; Heat Transfer; Temperate Regions

20010086476 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

Rainfall Generator for the Rhine Basin: Multi-Site Generation of Weather Variables for the Entire Drainage Area

Wojcik, Rafal, Royal Netherlands Meteorological Inst., Netherlands; Beersma, Jules J., Royal Netherlands Meteorological Inst., Netherlands; Buishand, T. Adri, Royal Netherlands Meteorological Inst., Netherlands; 2000; 42p; In English; Original contains color illustrations

Contract(s)/Grant(s): RI-2041

Report No.(s): KNMI-Publ-186-IV; ISBN 90-369-280-5; Copyright; Avail: Issuing Activity

This is the final report of a project on the development of a rainfall generator for the Rhine basin. The request for this generator arose from the need to study the likelihood of extreme river discharges in the Netherlands, using a hydrological/hydraulic model. Long-duration, multi-site simulations of daily precipitation and temperature time series for the entire Rhine basin are needed for this purpose. Temperature is included to determine snow accumulation and snowmelt. Daily precipitation and temperature data from 36 stations in Germany, Luxemburg, France and Switzerland for the period 1961-1995 are considered. Studies in earlier reports dealt with the German part of the basin only. Time series simulation is done by nearest-neighbour resampling. The method does not make restrictive assumptions about the underlying joint distribution of the multi-site precipitation and temperature data. In order to generate weather variables for day t , a feature vector $D(\text{sub } t)$ is formed to find the nearest neighbours of this day, or the previous day, in the historical data. For unconditional simulations D_t contains variables that characterize the weather on the previous day $t - 1$ (first order model) or a number of previous days (higher order model). Circulation indices for day t are included in $D(\text{sub } t)$ in the case of conditional simulation on the atmospheric circulation. A finite number k of nearest neighbours; in terms of a weighted Euclidean or the Mahalanobis distance is selected from the historical record. One of these k nearest neighbours is finally "resampled" using a discrete probability kernel. The criteria used to assess the performance of different simulation methods are the ability to reproduce the second-order moment statistics of daily and monthly values of precipitation and temperature and the distribution of multi-day winter (October-March) precipitation amounts. For the high-elevation stations in Germany and Switzerland the snowmelt simulation is also evaluated. First-order conditional and unconditional models for the generation of daily precipitation and temperature are considered. Conditional simulations were done with simulated circulation indices produced by a separate second-order resampling model. With respect to the reproduction of the above mentioned precipitation and temperature statistics unconditional simulations perform better than conditional simulations. Inclusion of circulation indices in the feature vector for unconditional simulations worsens the reproduction of the temperature statistics. Due to minor modifications in the resampling model the second-order moment statistics of precipitation were somewhat better preserved in the conditional simulations than in those for the German part of the Rhine basin in earlier reports. As a result the reproduction of multi-day winter maximum precipitation also compares favourably with the conditional simulations in earlier studies.

Derived from text

Rain; Atmospheric Circulation; Hydrology Models; Kernel Functions; Probability Theory; Time Series Analysis

20010086477 Instituto Nacional de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Assimilation of Radiances Information in Numerical Weather Prediction Models Using a Physical Space Statistical Analysis System *Assimilacao de Informacao de Radiancias em Modelos de Previsao Numerica do Tempo Utilizando um Sistema de Analise Objetiv a Estatistico em Espaco-Fisico*

Espinoza, Elizabeth Silvestre, Instituto Nacional de Pesquisas Espaciais, Brazil; 2001; 130p; In Portuguese; Original contains color illustrations

Report No.(s): INPE-8308-TDI/767; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The use of radiances in data assimilations systems can be of two forms: direct assimilation, or they may be pre-processed to retrieve geophysical parameters, like temperature or humidity for subsequent assimilation. The second process involved the inversion of a radiative transfer equation that is ill-posed, and therefore requires the use of prior information. In this work the variational techniques 1 D-Var and 3D-Var are used in order to compare the two processes of data assimilation (directly or retrievals) in the South Hemisphere, in the area delimited by 10 degrees N to 350 degrees S and 350 degrees W to 800 degrees W. These techniques are implemented and compared in a one-dimensional and three-dimensional assimilation system using simulated data from the TOVS 15 (HISR and MSU) infrared-temperature profiling instruments in relation with the parameters of geopotential and mixing ratio. The analysis error patterns indicated for both 1D-Var and 3D-Var radiance analysis have similar errors than the retrievals case. The computational cost for the radiance assimilation is also less than the retrieval option.

Author

Radiance; Data Systems; Meteorological Parameters; Atmospheric Models; Numerical Weather Forecasting; Data Processing; Statistical Weather Forecasting

20010086577 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

On the Behaviour of a Few Popular Verification Scores in Yes/No Forecasting

Kok, C. J., Royal Netherlands Meteorological Inst., Netherlands; 2000; ISSN 0169-1651; 80p; In English

Report No.(s): KNMI-WR-2000-04; ISBN 90-369-2178-3; Copyright; Avail: Issuing Activity

The main objective of verification in meteorology is to assess and quantify the quality of the forecasts. It offers a means to compare results of different models, methods or forecasters. In addition, their performance over different periods or years can be established in order to assess whether there is a general improvement or not. If, for instance, the results of two models or of a number of forecasters are compared for the same location and time period then it is fairly easy to judge which one performs best in terms of a given verification score.

Author

Forecasting; Meteorology; Position (Location)

20010086635 Argonne National Lab., IL USA

Initial Evaluation of Profiles of Temperature, Water Vapor, and Cloud Liquid Water from a New Microwave Profiling Radiometer

Liljegren, J. C.; Lesht, B. M.; Kato, S.; Clothiaux, E. E.; 2001; 10p; In English

Report No.(s): DE2001-768575; ANL/ER/CP-101899; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

To measure the vertical profiles of temperature and water vapor that are essential for modeling atmospheric processes, the Atmospheric Radiation Measurement (ARM) Program of the U. S. Department of Energy launches approximately 2600 radiosondes each year from its Southern Great Plains (SGP) facilities in Oklahoma and Kansas, USA. The annual cost of this effort exceeds \$500,000 in materials and labor. Despite the expense, these soundings have a coarse temporal resolution and reporting interval compared with model time steps. In contrast, the radiation measurements used for model evaluations have temporal resolutions and reporting intervals of a few minutes at most. Conversely, radiosondes have a much higher vertical spatial resolution than most models can use. Modelers generally reduce the vertical resolution of the soundings by averaging over the vertical layers of the model.

NTIS

Radiometers; Water Vapor; Evaluation; Temperature Measuring Instruments; Radiation Measurement

20010087129 NASA Ames Research Center, Moffett Field, CA USA

Cloud Microphysics in Hurricane Outflows: Observations in 'Bonnie' (1998) at 12 km Altitude

Pueschel, Rudolf F., NASA Ames Research Center, USA; Hallett, J., Desert Research Inst., USA; Strawa, A. W., NASA Ames Research Center, USA; Ferry, G. V., NASA Ames Research Center, USA; Bui, T. P., NASA Ames Research Center, USA; [2000]; 1p; In English; International Cloud Physics Conference, 20-24 Aug. 2000, Reno, NV, USA

Contract(s)/Grant(s): RTOP 622-65-08-10; No Copyright; Avail: Issuing Activity; Abstract Only

The water balance of a hurricane is controlled by boundary layer inflow, near vertical motion in the eyewall causing coalescence precipitation at above and residual ice precipitation at below freezing temperatures, and cirrus outflow at below -40 C aloft. In this paper we address the question of efficiency of water removal by this cirrus outflow which is important for the release of latent heat at high altitudes and its role in the dynamic flow at that level. During NASA's 1998 Convection and Moisture Experiment campaign we acquired microphysical outflow data in order to (1) determine the release and redistribution of latent heat near the top of hurricanes, (2) aid in TRMM algorithm development for remote sensing of precipitation, and (3) determine the optical/radiative characteristics of hurricane outflow. The data were acquired with Particle Measuring Systems two dimensional imaging spectrometers. On 23 August and again during the hurricane's landfall on 26 August, 1998, the NASA DC-8 aircraft penetrated hurricane 'Bonnie' four times each near 200 hPa pressure altitude. The eye crossing times were determined by (1) zero counts of cloud particles, (2) approximately 5 C increases in static and potential temperatures, and (3) minima in speeds and changes of direction of horizontal winds. The vertical winds showed shear between -6 m per second and +4 m per second and tangential winds approached 30 m per second in the eyewall. The particle volumes in the eyewall (determined by the pixels the particles shadowed in the direction of flight [x-direction] and normally to it by the number of diodes that they shadowed [y-direction]) ranged between 0.5 and 5.0 cubic centimeters per cubic meter. With a particle density near 0.2 g per cubic centimeter (determined from in situ melting and evaporation on a surface collector), the 1.0 g per meter corresponding mass of cloud ice ranged between 0.27 and 2.7 g per kilograms yielding horizontal fluxes between 8.1 and 81 g per square meters per second. The outflow ice was concentrated in crystals of a modal size of 190 micrometers. The particle size distributions were heavily skewed toward sizes with 98% of all cirrus particles smaller than the modal size comprising, however, only 20% of the mass. Thus the smaller than modal size particles dominantly affected the optical/radiative characteristics of the cloud, whereas the larger than modal size crystals determined the ice mass, hence dominated latent heating. Questions to be addressed relate to the origin of individual ice particles as the hurricane evolved and the likelihood of pristine and aggregate particle formation under the complicated conditions of rotation and outflow in the eyewall.

Author

Cloud Physics; Hurricanes; Remote Sensing; Altitude; Coalescing

20010087665 NASA Langley Research Center, Hampton, VA USA

Arctic Stratus Cloud Properties and Their Effect on the Surface Radiation Budget: Selected Cases from FIRE ACE

Doug, Xiquan, Utah Univ., USA; Mace, Gerald G., Utah Univ., USA; Minnis, Patrick, NASA Langley Research Center, USA; Young, David F., NASA Langley Research Center, USA; Journal of Geophysical Research; Jul. 27, 2001; ISSN 0148-0227; Volume 106, No. D14, pp. 15,297-15,312; In English

Contract(s)/Grant(s): DE-AI02-97ER-62341; NAG1-2250; NAG5-6458

Report No.(s): Paper-2000JD900404; Copyright; Avail: Issuing Activity

To study Arctic stratus cloud properties and their effect on the surface radiation balance during the spring transition season, analyses are performed using data taken during three cloudy and two clear days in May 1998 as part of the First ISCCP Regional Experiment (FIRE) Arctic Cloud Experiment (ACE). Radiative transfer models are used in conjunction with surface- and satellite-based measurements to retrieve the layer-averaged microphysical and shortwave radiative properties. The surface-retrieved cloud properties in Cases 1 and 2 agree well with the in situ and satellite retrievals. Discrepancies in Case 3 are due to spatial mismatches between the aircraft and the surface measurements in a highly variable cloud field. Also, the vertical structure in the cloud layer is not fully characterized by the aircraft measurements. Satellite data are critical for understanding some of the observed discrepancies. The satellite-derived particle sizes agree well with the coincident surface retrievals and with the aircraft data when they were collocated. Optical depths derived from visible-channel data over snow backgrounds were overestimated in all three cases, suggesting that methods currently used in satellite cloud climatologies derive optical depths that are too large. Use of a near-infrared channel with a solar infrared channel to simultaneously derive optical depth and particle size appears to alleviate this overestimation problem. Further study of the optical depth retrieval is needed. The surface-based radiometer data reveal that the Arctic stratus clouds produce a net warming of 20 W m(exp -2) in the surface layer during the transition season suggesting that these clouds may accelerate the spring time melting of the ice pack. This surface warming contrasts with the net cooling at the top of the atmosphere (TOA) during the same period. All analysis of the complete FIRE ACE data sets will be valuable for understanding the role of clouds during the entire melting and refreezing process that occurs annually in the Arctic.

Author

Arctic Regions; Stratus Clouds; Surface Layers; Surface Properties

20010087667 NASA Goddard Space Flight Center, Greenbelt, MD USA

Convective Systems Observed and Simulated During TRMM Field Campaigns

Tao, Wei-Kuo, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; TRMM/LBA-Eurocs, 28 May - 1 Jun. 2001, Lisbon, Portugal; No Copyright; Avail: Issuing Activity; Abstract Only

Recently completed TRMM field campaigns (TEFLUN-1998, SCSMEX-1998, TRMM.LBA-1999, and KWAJEX 1999) have obtained direct measurements of microphysical data associated with convective systems from various geographical locations. These TRMM field experiments were designed to contribute to fundamental understanding of cloud dynamics and microphysics, as well as for validation,, testing assumptions and error estimates of cloud-resolving models, forward radiative transfer models, algorithms used to estimate rainfall statistics and vertical structure of precipitation and latent heating from both surface-based radar and satellites.

Author

Cloud Physics; Error Analysis; Vertical Distribution; Radiative Transfer; Trmm Satellite

20010087976 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

KNMI Contribution to the European Project WRINCLE: Downscaling Relationships for Precipitation for Several European Sites

Beckmann, B.R., Royal Netherlands Meteorological Inst., Netherlands; Buishand, T. A., Royal Netherlands Meteorological Inst., Netherlands; 2001; ISSN 0169-1708; 58p; In English

Report No.(s): KNMI-TR-230; ISBN 90-369-2190-2; Copyright; Avail: Issuing Activity

Statistical downscaling of precipitation refers to statistical techniques that have been used to obtain precipitation data with the required spatial resolution for climate-change impact studies. It is widely acknowledged that the direct precipitation output of climate change simulations from General Circulation Models (GCMs) is inadequate for such studies. Statistical downscaling techniques make use of fitted relationships between observed precipitation and other meteorological variables that can be extracted from GCM simulations. The recent availability of reanalysis data from numerical weather prediction models offers new opportunities to improve the meteorological basis of statistical downscaling models. In this report the statistical linkage of daily precipitation to NCEP (National Center of Environmental Prediction) reanalysis data is described for eleven stations across Europe: De Bilt and Maastricht (the Netherlands), Hamburg, Hanover and Berlin (Germany), Vienna (Austria), Berne, Neuchatel and Payerne (Switzerland), and Salto de Bolarque and Munera (Spain). Daily data for the period 1968-1997 were considered. The work forms the KNMI (Koninklijk Nederalands Meteorologisch Instituut) contribution to the European project WRINCLE (Water Resources: the INfluence of CLimate change in Europe).

Author

Climate Change; Europe; Numerical Weather Forecasting; Precipitation (Meteorology); Atmospheric General Circulation Models; Statistical Analysis; Meteorological Parameters; Atmospheric Circulation

20010087977 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

Impact Assessment of a Doppler Wind Lidar in Space on Atmospheric Analyses and Numerical Weather Prediction

Marseille, G. J., Royal Netherlands Meteorological Inst., Netherlands; Stoffelen, A., Royal Netherlands Meteorological Inst., Netherlands; Bouttier, F., European Centre for Medium-Range Weather Forecasts, UK; Cardinali, C., European Centre for Medium-Range Weather Forecasts, UK; deHaan, S., Royal Netherlands Meteorological Inst., Netherlands; Vasiljevic, D., European Centre for Medium-Range Weather Forecasts, UK; 2001; ISSN 0169-1651; 64p; In English; Original contains color illustrations

Report No.(s): KNMI-WR-2001-03; ISBN 90-369-2194-5; Copyright; Avail: Issuing Activity

ESA (European Space Agency) has recently approved a Doppler Wind Lidar (DWL) to fly on a free-flyer platform orbiting dawn-dusk at 400 km altitude. Rigorous trade-off studies during the Atmospheric Dynamics Mission (ADM) phase-A have resulted in the definition of a lidar concept, hereafter named ADM_UV, operating in the ultraviolet part of the spectrum at 355 nm laser wavelength. In order to guarantee the demonstration value of this mission for Numerical Weather Prediction (NWP) and in climate studies, extended atmospheric analyses and forecast runs are needed to better quantify this potential DWL impact and to address specific issues of concern during the ADM phase A study, such as profile quality and coverage. The objective of this activity is demonstration of the impact on atmospheric circulation and on NWP of wind profiles from ADM_UV and comparison to the impact of conventional wind profiles (TEMP/PILOT) with respect to the existing Global Observing System (GOS). This demonstration is made by means of OSSEs (Observing System Simulation Experiments). it serves to consolidate the requirements for an operational mission by assessing the sensitivity of the impact of ADM_UV to key mission parameters to aid in the design

of future operational missions, as well as to demonstrate the impact of the minimum useful requirements and performance of the Atmospheric Dynamics Earth Explorer Mission.

Author

Atmospheric Circulation; Numerical Weather Forecasting; Optical Radar; Wind Profiles; Computerized Simulation; Atmospheric Sounding; Atmospheric Models; Climate

20010088779 Simpson Weather Associates, Inc., Charlottesville, VA USA

A Geosynchronous Lidar System for Atmospheric Winds and Moisture Measurements

Emmitt, G. D., Simpson Weather Associates, Inc., USA; [2001]; 3p; In English; International Geoscience and Remote Sensing Symposium, July 2001, Sydney, Australia; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

An observing system comprised of two lidars in geosynchronous orbit would enable the synoptic and meso-scale measurement of atmospheric winds and moisture both of which are key first-order variables of the Earth's weather equation. Simultaneous measurement of these parameters at fast revisit rates promises large advancements in our weather prediction skills. Such capabilities would be unprecedented and a) yield greatly improved and finer resolution initial conditions for models, b) make existing costly and cumbersome measurement approaches obsolete, and c) obviate the use of numerical techniques needed to correct data obtained using present observing systems. Additionally, simultaneous synoptic wind and moisture observations would lead to improvements in model parameterizations, and in our knowledge of small-scale weather processes. Technology and science data product assessments are ongoing. Results will be presented during the conference.

Author

Optical Radar; Wind (Meteorology); Weather Forecasting; Atmospheric Moisture; Remote Sensing; Satellite Observation

20010089137 Colorado Univ., Cooperative Inst. for Research in Environmental Science, Boulder, CO USA

Removing Atmospheric Effects From AVIRIS Data for Surface Reflectance Retrievals

Gao, Bo-Cai, Colorado Univ., USA; Goetz, Alexander F. H., Colorado Univ., USA; Zamudio, J. A., Colorado Univ., USA; [1991]; 7p; In English; Third Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) Workshop, 20-24 May 1991, Pasadena, CA, USA Contract(s)/Grant(s): JPL-958039; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Analysis of high resolution imaging spectrometer data requires a thorough compensation for atmospheric absorption and scattering. A method for retrieving surface reflectances from spectral data collected by the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) is being developed. In this method, the integrated water vapor amount on a pixel by pixel basis is derived from the 0.94- and 1.14-micrometer water vapor features. The water vapor, carbon dioxide (CO₂), oxygen (O₂) and methane (CH₄) transmission spectrum in the 0.4-2.5 micrometer region is calculated. The derived water vapor value and the solar and observational geometry are used in the spectral calculation. The AVIRIS spectrum is ratioed against the transmission spectrum to obtain the surface reflectance spectrum. Major mineral absorption features near 2.2 micrometer in retrieved reflectance spectra can be identified. Different vegetation absorption characteristics are observed. At present, the method is most useful for deriving surface reflectances from AVIRIS data measured on clear days with high visibilities. Atmospheric scattering effects will be included in our spectral calculations in the near future.

Author

Atmospheric Effects; Spectral Reflectance; Atmospheric Scattering; Imaging Techniques

20010089225 NASA Goddard Space Flight Center, Greenbelt, MD USA

Effect of Clouds on the Atmospheric Solar Heating in the Tropical Western Pacific

Chou, Ming-Dah, NASA Goddard Space Flight Center, USA; Chan, Pui-King, Science Systems and Applications, Inc., USA; Yan, Michael M.-H., Science Systems and Applications, Inc., USA; [2001]; 1p; In English; Chapman Conference on Atmospheric Solar Heating in the Tropical Western Pacific, 13-17 Aug. 2001, Estes Park, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The sea surface solar radiative fluxes have been retrieved from the radiances measured by Japan's Geostationary Meteorological Satellite 5. The surface radiation data set covers the domain 40S-40N and 90E-170W and a period starting from January 1998. The retrieved surface radiation has been validated with the radiometric measurements at the Atmospheric Radiation Measurement (ARM) site on Manus Island in the equatorial western Pacific. Together with the Clouds and the Earth's Radiant Energy System (CERES) solar fluxes at the top of the atmosphere and the radiative transfer calculations of clear-sky fluxes, this surface radiation data set was used to study the impact of clouds on the solar heating of the atmosphere. It was found that clouds

enhanced the atmospheric solar heating by approx. 21 watts per meter squared in the tropical western Pacific and the South China Sea, and the ratio of the cloud radiative forcing at the surface to that at the TOA was approximately 1.6.

Author

Solar Heating; Atmospheric Heating; Atmospheric Radiation; Clouds (Meteorology); Radiative Transfer; Radiation Measurement

20010089226 NASA Marshall Space Flight Center, Huntsville, AL USA

TRMM: Status of Precipitation Estimates and Science Highlights

Shepherd, J. Marshall, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 7th International Conference on Precipitation, 30 Jun. - 2 Jul. 2001, Rockport, ME, USA; No Copyright; Avail: Issuing Activity; Abstract Only

As a part of NASA's Earth System Enterprise, the Tropical Rainfall Measuring Mission (TRMM) seeks to understand the mechanisms through which changes in tropical rainfall influence global circulation. Over the past 3 years, TRMM has contributed significantly towards reducing uncertainty in satellite estimates of rainfall in the Tropics, where almost 67% of the Earth's rain falls. TRMM has provided knowledge related to the climatology, seasonality, and variation of tropical rainfall; the mesoscale structure of rain-producing systems; and the physics of precipitation. An overview of these results will be presented. Additionally, a summary of research highlights will be presented focusing on application of TRMM data to topics such as hurricane monitoring, climate analysis, forecasting, microphysics, environmental impacts, and El Nino/La Nina. Examples and plans for operational use of TRMM data in tropical cyclone monitoring and other applications will also be given.

Author

Trmm Satellite; Tropical Regions; Rain; Forecasting; Climatology; Mesoscale Phenomena; Estimates

20010089250 NASA Goddard Inst. for Space Studies, New York, NY USA

Observed and Simulated Radiative and Microphysical Properties of Tropical Convective Storms

DelGenio, Anthony D., NASA Goddard Inst. for Space Studies, USA; [2001]; 1p; In English; American Geophysical Union Spring 2001 Meeting, 29-30 May 2001, Boston, MA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Increases in the ice content, albedo and cloud cover of tropical convective storms in a warmer climate produce a large negative contribution to cloud feedback in the GISS GCM. Unfortunately, the physics of convective upward water transport, detrainment, and ice sedimentation, and the relationship of microphysical to radiative properties, are all quite uncertain. We apply a clustering algorithm to TRMM satellite microwave rainfall retrievals to identify contiguous deep precipitating storms throughout the tropics. Each storm is characterized according to its size, albedo, OLR, rain rate, microphysical structure, and presence/absence of lightning. A similar analysis is applied to ISCCP data during the TOGA/COARE experiment to identify optically thick deep cloud systems and relate them to large-scale environmental conditions just before storm onset. We examine the statistics of these storms to understand the relative climatic roles of small and large storms and the factors that regulate convective storm size and albedo. The results are compared to GISS GCM simulated statistics of tropical convective storms to identify areas of agreement and disagreement.

Author

Tropical Storms; Clouds (Meteorology); Climatology; Cluster Analysis; Satellite Observation

20010089320 Science Applications International Corp., McLean, VA USA

Low-Frequency Oscillations and Transport Processes Induced by Multiscale Transverse Structures in the Polar Wind Outflow: A Three-Dimensional Simulation

Ganguli, Supriya B., Science Applications International Corp., USA; Gavrishchaka, Valeriy V., Science Applications International Corp., USA; [1999]; 27p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Multiscale transverse structures in the magnetic-field-aligned flows have been frequently observed in the auroral region by FAST and Freja satellites. A number of multiscale processes, such as broadband low-frequency oscillations and various cross-field transport effects are well correlated with these structures. To study these effects, we have used our three-dimensional multifluid model with multiscale transverse inhomogeneities in the initial velocity profile. Self-consistent-frequency mode driven by local transverse gradients in the generation of the low field-aligned ion flow and associated transport processes were simulated. Effects of particle interaction with the self-consistent time-dependent three-dimensional wave potential have been modeled using a distribution of test particles. For typical polar wind conditions it has been found that even large-scale (approximately 50 - 100 km) transverse inhomogeneities in the flow can generate low-frequency oscillations that lead to significant flow modifications, cross-field particle diffusion, and other transport effects. It has also been shown that even small-amplitude (approximately 10 - 20%) short-scale (approximately 10 km) modulations of the original large-scale flow profile significantly increases low-frequency mode generation and associated cross-field transport, not only at the local spatial scales imposed by the

modulations but also on global scales. Note that this wave-induced cross-field transport is not included in any of the global numerical models of the ionosphere, ionosphere-thermosphere, or ionosphere-polar wind. The simulation results indicate that the wave-induced cross-field transport not only affects the ion outflow rates but also leads to a significant broadening of particle phase-space distribution and transverse particle diffusion.

Author

Geomagnetism; Particle Interactions; Computerized Simulation; Earth Ionosphere; Troposphere

20010089370 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

Analysis of Cloud-to-Ground Lightning Clusters with Radar Composite Imagery

Scott, Rhonda B.; Mar. 06, 2001; 87p; In English

Report No.(s): AD-A392544; AFIT/GM/ENP/01M-06; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The most recent research conducted at the Air Force Institute of Technology involved studying a large volume of lightning data without coupling radar imagery (Parsons 2000). Parsons finding could not be acted on because no individual storms were studied. The primary goal of this research is to determine whether the techniques used by Parsons can be applied to storms by examining the radar imagery and lightning data. This research used the methodology applied to lightning data by Parsons and radar imagery to determine whether the location of lightning clusters were located near storms. A composite reflectivity radar image was generated and the lightning data for the corresponding time was plotted to determine if lightning clusters corresponded to storm coverage area. After a visual analysis of the radar and lightning cluster plots was conducted, the percentage of lightning clusters found in each radar image was calculated. Caution needs to be applied when calculating the distance to the flashes isolated from nearby clusters since the clusters were found to be near the edge of the storms studied and not under the convective core of the storm. This research was successful in proving that the DBSF method may be applied, however more research must be done to determine what location of the storm provides the best distance criteria measurements.

DTIC

Cloud-to-Ground Discharges; Image Processing; Storms (Meteorology)

20010089375 Royal Netherlands Meteorological Inst., De Bilt, Netherlands

Hail Detection Using Single-Polarization Radar

Holleman, Iwan, Royal Netherlands Meteorological Inst., Netherlands; 2001; ISSN 0169-1651; 78p; In English

Report No.(s): KNMI-WR-2001-01; ISBN 90-369-2186-4; Copyright; Avail: Issuing Activity

Within the framework of the project "Development of a product for detection of severe weather phenomena using non-Doppler radar data", a tool for the detection and display of severe weather phenomena related to convective systems, like wind gusts and summer hail, is being developed. Currently, KNMI (Koninklijk Nederlands Meteorologisch Instituut) operates two Gematronik C-band Doppler radars which are performing low-elevation volume scans every five minutes and extensive volume scans every 15 minutes. From the low-elevation volume scans, a "pseudo constant-altitude plan-position indicator" (pseudoCAPPI) of the radar reflectivity and an echotop product, which presents the maximum height of the echo for each pixel, are extracted. Ground clutter is removed from the pseudoCAPPI image using a statistical method. This report describes the development of the first new sub-product: a tool for the detection and display of summer hail. This hail detection product is to be used for nowcasting of the development and movement of summertime thunderstorms. In addition, an archive of this hail detection product could be a useful reference for insurance companies.

Author

Meteorological Instruments; Hail; Radar Detection; Statistical Analysis

48

OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

20010083382 Research Inst. of National Defence, Div. of Systems and Underwater Technology, Stockholm, Sweden

Electromagnetic Surveillance with Mobile Platforms. A Study of Sensor Noise *Elektromagnetisk Spaning Med Mobila Plattformar: En Studie av Sensorbrus*

Brage, A.; Lindqvist, P.; Sigra, P.; Dec. 2000; 22p; In Swedish

Report No.(s): PB2001-107302; FOA-R-00-00-01764-409-SE; No Copyright; Avail: Issuing Activity

Electrodes as sensors in marine environment have been used on a regular basis for surveillance and signature applications. In these, the electrodes are protected from noise by the depth of the water column. In this report the authors are investigating the usability of electrodes in mobile systems. The noise level associated with moving water has been studied. The results show that the amplitude of noise increases with up to a factor of 100 in the frequency interval 0.1 to 10 Hz. At lower frequencies the relative increase is lower but in an absolute measure higher. It was not possible to detect any difference in noise levels between the carbon fiber and Ag/AgCl electrodes. The conclusion is that despite the increase of noise, the electrodes can be used on mobile platforms, i.e. for self ranging and surveillance. Special designed tests should be performed to investigate the effect of protection against water movements on the electrode.

NTIS

Marine Environments; Surveillance; Electrodes; Noise (Sound); Sensors; Electromagnetism

20010084308 NASA Goddard Space Flight Center, Greenbelt, MD USA

Single and Double ITCZ in Aqua-Planet Models with Globally Uniform Sea Surface Temperature and Solar Insolation: An Interpretation

Chao, Winston C., NASA Goddard Space Flight Center, USA; Chen, Baode, Maryland Univ. Baltimore County, USA; [2001]; 16p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It has been known for more than a decade that an aqua-planet model with globally uniform sea surface temperature and solar insolation angle can generate ITCZ (intertropical convergence zone). Previous studies have shown that the ITCZ under such model settings can be changed between a single ITCZ over the equator and a double ITCZ straddling the equator through one of several measures. These measures include switching to a different cumulus parameterization scheme, changes within the cumulus parameterization scheme, and changes in other aspects of the model design such as horizontal resolution. In this paper an interpretation for these findings is offered. The latitudinal location of the ITCZ is the latitude where the balance of two types of attraction on the ITCZ, both due to earth's rotation, exists. The first type is equator-ward and is directly related to the earth's rotation and thus not sensitive to model design changes. The second type is poleward and is related to the convective circulation and thus is sensitive to model design changes. Due to the shape of the attractors, the balance of the two types of attractions is reached either at the equator or more than 10 degrees away from the equator. The former case results in a single ITCZ over the equator and the latter case a double ITCZ straddling the equator.

Author

Sea Surface Temperature; Ocean Models; Intertropical Convergent Zones

20010084781 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden

Simulation of the Thermocline Development in the Baltic Sea during the Spring 1997 *Simulering av Termoklinens Utveckling i Ostersjön Under Varen 1997*

Nycander, J.; Dec. 2000; ISSN 1104-9154; 26p; In English

Report No.(s): PB2001-107288; FOA-R-00-01740-409-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Temperature profiles obtained from simulations with the Baltic ocean circulation models RCO and BPOM are compared with observed profiles. The models are forced with meteorological data from the period 1 April - 10 June 1997. RCO successfully models the development of the thermocline in the central Baltic Sea, with an error of around 1 C or less at the end of the simulation period. The simulation with BPOM gives a much larger error, more than 3 C at the surface.

NTIS

Meteorological Parameters; Baltic Sea; Thermoclines; Ocean Models; Ocean Temperature; Climatology; Climate Change

51

LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20010083252 Chicago Univ., Chicago, IL USA

A Micro-Simulation Model of the Benefits and Costs of Prostate Cancer Screening and Treatment *Annual Report, 1 Jul. 1999 - 30 Jun. 2000*

Meltzer, David O., Chicago Univ., USA; July 2000; 18p; In English

Contract(s)/Grant(s): DAMD17-98-1-8600

Report No.(s): AD-A390031; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Our project is completing work on an innovative model to determine the cost-effectiveness of alternative prostate cancer screening strategies. Indeed, prostate cancer screening remains controversial and continues to present difficult choices for patients, physicians, and policy makers. Hence, modeling the natural history, screening, and treatment of prostate cancer to better understand screening benefits and costs is potentially of great value. To date, we have reviewed every published cost-effectiveness analysis of prostate cancer screening. While these papers have many strengths, all of them have flaws that undermine their validity and relevance. We have addressed these concerns extensively in the model we have developed. We have now finished programming the model and are currently fitting the model using constrained optimization and maximum likelihood techniques. We have also performed preliminary analyses of annual screening with digital rectal exam (DRE), prostate specific antigen (PSA), or their combination. These analyses suggest that screening may be cost-effective in terms of cost per life-year saved; however, analyses in terms of cost per Quality Adjusted Life-Year (QALY) suggest that their cost-effectiveness is highly dependent on quality of life weights for health states. We will be finishing our analyses and preparing manuscripts for publication over the next few months.

DTIC

Costs; Prostate Gland; Cancer; Simulation; Antigens

20010083253 Ohio State Univ., Research Foundation, Columbus, OH USA

Sugimoto, Yasuro; Jul. 2000; 10p; In English

Contract(s)/Grant(s): DAMD17-99-1-9341

Report No.(s): AD-A388578; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Our recent findings suggest that keratinocyte growth factor (KGF), the seventh member of the fibroblast growth factor family, is capable of acting as a mediator of the stimulatory effects of estrogen in human breast cancer cells. Interestingly, estrogen stimulates KGF expression. This role of estrogens in the regulation of KGF expression is intriguing because hormonal stimulation is an essential factor in the carcinogenesis of human breast cells, especially during early stages. Therefore, it is possible that KGF could be intimately involved in both physiological and pathological processes in human breast tissue. Thus, the ability to interrupt the stimulatory effects of estrogen in human breast cancer cells at the level of KGF holds potential value as a strategy for development of a potential therapeutic agent for breast cancer. Consequently, we have proposed to synthesize potential KGF antagonists, which will then be evaluated for efficacy in vitro assay systems. During the first year of this funding period, we have concentrated in peptide antagonist synthesis and development of an assay system. There were unexpected difficulties on the peptide syntheses, however, we have found a way to synthesize those peptides.

DTIC

Cancer; Carcinogens; Estrogens; Assaying; Physiology

20010083360 NASA Ames Research Center, Moffett Field, CA USA

Reduced Gas Cycling in Microbial Mats: Implications for Early Earth

Hoehler, Tori M., NASA Ames Research Center, USA; Bebout, Brad M., NASA Ames Research Center, USA; DesMarais, David J., NASA Ames Research Center, USA; Oct. 05, 2000; 1p; In English

Contract(s)/Grant(s): RTOP 344-38-32-03; No Copyright; Avail: Issuing Activity; Abstract Only

For more than half the history of life on Earth, biological productivity was dominated by photosynthetic microbial mats. During this time, mats served as the preeminent biological influence on earth's surface and atmospheric chemistry and also as the primary crucible for microbial evolution. We find that modern analogs of these ancient mat communities generate substantial quantities of hydrogen, carbon monoxide, and methane. Escape of these gases from the biosphere would contribute strongly to atmospheric evolution and potentially to the net oxidation of earth's surface; sequestration within the biosphere carries equally important implications for the structure, function, and evolution of anaerobic microbial communities within the context of mat biology.

Author

Biosphere; Microorganisms; Gases; Earth Surface

20010083361 NASA Ames Research Center, Moffett Field, CA USA

Minimum Energy Requirements for Sustained Microbial Activity in Anoxic Sediments

Hoehler, Tori M., NASA Ames Research Center, USA; Alperin, Marc J., NASA Ames Research Center, USA; Albert, Daniel B., NASA Ames Research Center, USA; Martens, Christopher S., NASA Ames Research Center, USA; Oct. 05, 2000; 1p; In English; 2000 Fall AGU Meeting, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA

Contract(s)/Grant(s): RTOP 344-38-32-03; No Copyright; Avail: Issuing Activity; Abstract Only

Currently understood mechanisms of biochemical energy conservation dictate that, in order to be biologically useful, energy must be available to organisms in "quanta" equal to, at minimum one-third to one-fifth of the energy required to synthesize ATP in vivo. The existence of this biological energy quantum means that a significant fraction of the chemical amp on Earth cannot be used to drive biological productivity, and places a fundamental thermodynamic constraint on the origins, evolution, and distribution of life. We examined the energy requirements of intact microbial assemblages in anoxic sediments from Cape Lookout Bight, NC, USA, using dissolved hydrogen concentrations as a non-invasive probe. In this system, the thermodynamics of metabolic processes occurring inside microbial cells is reflected quantitatively by H₂ concentrations measured outside those cells. We find that methanogenic archaea are supported by energy yields as small as 10 kJ per mol, about half the quantity calculated from studies of microorganisms in culture. This finding implies that a significantly broader range of geologic and chemical niches might be exploited by microorganisms than would otherwise be expected.

Author

Anoxia; Energy Requirements; Microorganisms; Sediments; Cells (Biology)

20010083381 NASA Ames Research Center, Moffett Field, CA USA

Hydrogen Fluxes from Photosynthetic Communities: Implications for Early Earth Biogeochemistry

Hoehler, Tori M., NASA Ames Research Center, USA; Bebout, Brad M., NASA Ames Research Center, USA; DesMarais, David J., NASA Ames Research Center, USA; Oct. 05, 2000; 1p; In English; 2001 ASLO Meeting, 12-16 Feb. 2001, Albuquerque, NM, USA; Sponsored by American Society of Limnology and Oceanography, USA

Contract(s)/Grant(s): RTOP 344-38-32-03; No Copyright; Avail: Issuing Activity; Abstract Only

More than half the history of life on Earth was dominated by photosynthetic microbial mats, which must have represented the preeminent biological influence on global geochemical cycling during that time. In modern analogs of then ancient communities, hypersaline microbial mats from Guerrero Negro, Mexico, we have observed a large flux of molecular hydrogen originating in the cyanobacteria-dominated surface layers. Hydrogen production follows a distinct diel pattern and is sensitive to both oxygen tension and microbial species composition within the mat. On an early Earth dominated by microbial mats, the observed H₂ fluxes would scale to global levels far in excess of geothermal emissions. A hydrogen flux of this magnitude represents a profound transmission of reducing power from oxygenic photosynthesis, both to the anaerobic biosphere, where H₂ is an almost universally-utilized substrate and regulator of microbial redox chemistry, and to the atmosphere, where subsequent escape to space could provide an important mechanism for the net oxidation of Earth's surface.

Author

Biogeochemistry; Hydrogen; Photosynthesis; Microorganisms; Earth Surface

20010083466 NASA Ames Research Center, Moffett Field, CA USA

Skin Friction and Transition Location Measurement on Supersonic Transport Models

Kennelly, Robert A., Jr., NASA Ames Research Center, USA; Goodsell, Aga M., NASA Ames Research Center, USA; [2000]; 18p; In English; 9th International Symposium on Flow Visualization 2000, 2000, Edinburgh; Original contains color illustrations
Contract(s)/Grant(s): RTOP 537-07-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flow visualization techniques were used to obtain both qualitative and quantitative skin friction and transition location data in wind tunnel tests performed on two supersonic transport models at Mach 2.40. Oil-film interferometry was useful for verifying boundary layer transition, but careful monitoring of model surface temperatures and systematic examination of the effects of tunnel start-up and shutdown transients will be required to achieve high levels of accuracy for skin friction measurements. A more common technique, use of a subliming solid to reveal transition location, was employed to correct drag measurements to a standard condition of all-turbulent flow on the wing. These corrected data were then analyzed to determine the additional correction required to account for the effect of the boundary layer trip devices.

Author

Friction Measurement; Skin Friction; Supersonic Transports; Turbulent Flow

20010084322 California Univ., Los Angeles, CA USA

The Function of PTEN Tumor Suppressor Gene in Prostate Cancer Development *Annual Report, 15 Feb. 2000-14 Feb. 2001*

Wu, Hong; Mar. 2001; 13p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-00-1-0010

Report No.(s): AD-A392460; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Prostate cancer is the most common malignancy in men. Studying the biology of prostate cancer and development of new therapies are hampered by a lack of insight into the molecular basis of the disease and appropriate animal models. The recently

identified tumor suppressor gene PTEN is a promising candidate for being involved in prostate cancer since it is frequently deleted in prostate cancer, especially in advanced or metastatic forms. to study the function of PTEN in prostate cancer development, we have deleted Pten gene and generated an animal model system. Mice lacking one allele of Pten gene developed prostate abnormalities, ranging from hyperplasia to malignant carcinomas, starting from the eighth month. to accelerate this process, we have generated Pten(loxp/loxp) mice, which will allow us to delete Pten specifically in the prostate glands. We are currently breeding the Pten(loxp/loxp) mice with prostate specific Cre transgenic mice. We have also generated a TAT-Cre fusion protein which will allow us to focally delete Pten by surgical injection into the prostate. This study will not only allow us to better understand the function of PTEN in prostate cancer, but will generate a novel animal model for possible treatment.

Transl. by Schreiber

Cancer; Prostate Gland; Genes; Proteins; Suppressors; Therapy

20010084436 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA

Design and Synthesis of New Breast Cancer Chemotherapeutic Agents *Final Report, 15 Jul. 1998-14 Jul. 2001*

Winkler, Jeffrey D.; Aug. 2001; 61p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-98-1-8329

Report No.(s): AD-A392461; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This project is directed towards the design and synthesis of new drugs to treat breast cancer. Several naturally occurring substances have recently been discovered that have the same biological activity as the very important anticancer drug Taxol. We are using both computational and synthetic approaches to determine the parts of these very different compounds that are important for their biological activity. The determination of these critical parts could lead to the development of simpler structures that could be very powerful anticancer drugs. During the grant award period, we have prepared new structures based on the taxol-like substance epothilone. While the structures of the new compounds that we have prepared are very much like epothilone itself, we have not yet been able to prepare a simple structure with the same anticancer properties as taxol and epothilone.

DTIC

Cancer; Mammary Glands; Chemotherapy; Drugs

20010084437 Brigham and Women's Hospital, Boston, MA USA

FACTS (Find the Appropriate Clinical Trials) for You: A Computer-Based Decision Support System for Breast Cancer Patients *Annual Report, 20 Apr. 2000-19 Apr. 2001*

Ohno-Machado, Lucila; May 2001; 41p; In English

Contract(s)/Grant(s): DAMD17-98-1-8039

Report No.(s): AD-A392468; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Find Appropriate Clinical Trials (FACTS) system was redesigned to make it more accurate and compliant with existing standards. An explicit data model of patient eligibility for breast cancer clinical trials was developed, and served as the basis for encoding eligibility criteria. Standard vocabularies were utilized to represent concepts used in the system, and to retrieve their hierarchical relationships. The system now uses Bayesian networks to handle missing patient information. Protocols are presented to the user ranked by the likelihood that the patient is eligible for each one of them. As a result of a detailed data model, most of the eligibility criteria in ten clinical trial protocols taken from the National Cancer Institute database were encoded and the performance of the system was compared to that of two oncologists. In a preliminary evaluation, there was a good agreement between the system's selection of clinical trials and those of two oncologists (kappa 0.86, 0.76). All cases in which the system's selection of a protocol did not agree with any of the physicians were analyzed, and the system's limitations were identified. The disagreement on ranking the protocols (kappa 0.24, 0.14) is discussed.

DTIC

Networks; Bayes Theorem; Decision Support Systems; Cancer; Mammary Glands

20010084439 JAYCOR, San Diego, CA USA

Modeling for Military Operational Medicine Scientific and Technical Objectives Subtitle - Control of Respiration Source Book

Stuhmiller, Louise M.; Stuhmiller, James H.; May 2001; 265p; In English

Contract(s)/Grant(s): DAMD17-00-C-0031

Report No.(s): AD-A392471; JTR-J3150-12-01-141; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The US Army Medical Research and Materiel Command (MRMC) has responsibility to conduct research that will support the assessment of immediate incapacitation and injury caused by acute exposure to toxic gases, particles, and aerosols. The assessment must account for physical activity, environmental conditions, and complex mixtures of gases. The Military

Operational Medicine Research Program (MOMRP) is conducting a research program to develop a mathematical model of the physiological response to acute toxic gas exposure that will provide a standard means to estimate these effects. That program is called Scientific and Technical Objective Y: Inhalation Injury and Toxicology Models. The model will be developed in incremental steps. The first version of the model will provide a means of estimating immediate incapacitation in man, employing empirical relations for key physiological processes. Successive improvements to the model will add more complete physiological models of breathing, blood, chemistry, airway transport and deposition, metabolism and so forth as required to capture the necessary mechanisms. The technical approach to achieve this objective are to: (1) assess the literature for mechanisms, models, and data pertinent to the particular phase of model development; (2) implement mathematical models incorporating those mechanisms and validate by those data; and (3) conduct animal studies to provide missing physiological parameters or needed confirmation results. This approach will be repeated for each increment of the model development.

DTIC

Metabolism; Research and Development; Wound Healing; Injuries; Respiratory System

20010084440 JAYCOR, San Diego, CA USA

Modeling for Military Operational Medicine Scientific and Technical Objectives Subtitle - Acute Toxic Effects Data Book

Stuhmiller, Louise M.; Stuhmiller, James H.; May 2001; 75p; In English

Contract(s)/Grant(s): DAMD17-00-C-0031

Report No.(s): AD-A392472; JTR-J3150-12-01-138; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The US Army Medical Research and Materiel Command (MRMC) has responsibility to conduct research that will support the assessment of immediate incapacitation and injury caused by acute exposure to toxic gases, particles, and aerosols. The assessment must account for physical activity, environmental conditions, and complex mixtures of gases. The Military Operational Medicine Research Program (MOMRP) is conducting a research program to develop a mathematical model of the physiological response to acute toxic gas exposure that will provide a standard means to estimate these effects. That program is called Scientific and Technical Objective Y: Inhalation Injury and Toxicology Models. The model will be developed in incremental steps. The first version of the model will provide a means of estimating immediate incapacitation in man, employing empirical relations for key physiological processes. Successive improvements to the model will add more complete physiological models of breathing, blood, chemistry, airway transport and deposition, metabolism and so forth as required to capture the necessary mechanisms. The technical approach to achieve this objective is to: (1) assess the literature for mechanisms, models, and data pertinent to the particular phase of model development; (2) implement mathematical models incorporating those mechanisms and validate by those data; and (3) conduct animal studies to provide missing physiological parameters or needed confirmation results. This approach will be repeated for each increment of the model development.

DTIC

Toxicity; Gases; Physiological Effects; Military Technology; Wound Healing; Research and Development

20010084443 JAYCOR, San Diego, CA USA

Modeling for Military Operational Medicine Scientific and Technical Objectives Subtitle - Immediate Incapacitation Source Book

Stuhmiller, Louise M.; Stuhmiller, James H.; May 2001; 211p; In English

Contract(s)/Grant(s): DAMD17-00-C-0031

Report No.(s): AD-A392477; JAYCOR-J3150-12-01-113; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The US Army Medical Research and Materiel Command (MRMC) has responsibility to conduct research that will support the assessment of immediate incapacitation and injury caused by acute exposure to toxic gases, particles, and aerosols. The assessment must account for physical activity, environmental conditions, and complex mixtures of gases. The Military Operational Medicine Research Program (MOMRP) is conducting a research program to develop a mathematical model of the physiological response to acute toxic gas exposure that will provide a standard means to estimate these effects. That program is called Scientific and Technical Objective Y: Inhalation Injury and Toxicology Models. The model will be developed in incremental steps. The first version of the model will provide a means of estimating immediate incapacitation in man, employing empirical relations for key physiological processes. Successive improvements to the model will add more complete physiological models of breathing, blood, chemistry, airway transport and deposition, metabolism and so forth as required to capture the necessary mechanisms.

DTIC

Toxicity; Exposure; Medical Services; Military Operations; Physiological Effects; Toxicology; Toxic Hazards; Aerosols

20010084462 Baylor Coll. of Medicine, Houston, TX USA

Anti-HER2/Toxin Expressing Lymphocytes for Breast Cancer Therapy Annual Report, 1 May 1998-30 Apr 2001

Strube, Randall; May 2001; 8p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-98-1-8036

Report No.(s): AD-A392692; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Cyclin E is a key regulator of the mammalian cell cycle, as it is rate limiting for progression from G1 to S phase. Deranged cyclin E expression has been found both quantitatively (overexpression) and qualitatively (multiple isoforms) in almost all breast cancer cell lines and patient tissue samples. In spite of the apparent significance of altered cyclin E expression, the role of cyclin E overexpression in the transformation and proliferation of breast cancer cells has not been established. Using an intrabody approach, we are developing a model to phenotypically knock out cyclin E in breast cancer cells to investigate the role cyclin E plays in the tumorigenicity of these cells. We have constructed two anti-cyclin E single-chain antibodies (sFv) and have displayed their ability to bind cyclin E by ELISA. We have successfully targeted expression of these intrabodies to the cytosol and nucleus of breast cancer cell lines (SKSR3 and MCF-7) as conjugates with the human IgG constant region fragment(sFv-Fc). We are currently investigating the effect of anti-cyclin E intrabodies on the growth and tumorigenicity of clonal SKBR3 and MCF-7 cell lines either stably or inducibly expressing the intrabodies.

DTIC

Cancer; Mammary Glands; Lymphocytes; Therapy

20010084464 Wisconsin Univ., Madison, WI USA

Identification of a Modifier Locus Affecting Susceptibility to Mammary Tumor Development in Mice Final Report, 1 May 1998-30 Apr 2001

Moser, Amy; May 2001; 24p; In English

Contract(s)/Grant(s): DAMD17-98-1-8261

Report No.(s): AD-A392700; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have been using genetically predisposed mice to identify genes that can modify the risk of mammary tumor development. We have found that a congenic strain of mice that carries as a transgene a retroviral insertion of a LacZ-neoR gene (ROSA26 mice) on chromosome 6, are resistant to Min-induced mammary tumor development. In the ROSA26 mice, the insertion is flanked by about 25 cM of DNA derived from the 129 strain. In order to localize the locus or loci encoding the resistance, we produced mice carrying subsets of the 129 derived DNA from the congenic region. Analysis of six lines indicated that a strong modifier of mammary tumor development mapped within 2 cM of the ROSA26 insertion. This modifier also affects intestinal tumor growth. In addition, prepubertal female and male mice carrying the minimal modifier interval have a significantly smaller extent of mammary gland growth than do age-matched controls. Animals carrying the insertion have slower growth rates than wild-type mice. Finally, we have shown that the effect seen in the ROSA26 mice is due to the insertion and not to linked modifier loci.

DTIC

Deoxyribonucleic Acid; Genes; Mammary Glands; Mice; Cancer

20010084635 Boston Univ., Medical Campus, Boston, MA USA

Role of NF-kB/Rel in the Etiology of Breast Cancer Final Report, 1 Feb. 1998 - 31 Jan. 2001

Sonenshein, Gail E.; Feb. 2001; 95p; In English

Contract(s)/Grant(s): DAMD17-98-1-8001

Report No.(s): AD-A390443; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

Recent evidence suggests one reason for the rise in breast cancer incidence is increased exposure to and bioaccumulation of environmental pollutants. Work from the Pi's laboratory has demonstrated that human breast tumor cell lines and primary breast tumor tissue constitutively express high levels of functional nuclear NF-kappa B/Rel activity, in contrast to untransformed breast epithelial cells or mammary tissue. Experiments are proposed using cell lines in culture, primary tissue and a transgenic mouse model to test the role of nuclear NF-kappa B/Rel activity in the etiology of breast cancer. The results of these studies will provide important information on the potential role of NF-kB/Rel factor overexpression in the etiology of breast disease. Rel factors represent an important link between environmental factors and the increased incidence of breast cancer. The different patterns of Rel factor expression in various tumors suggest the possibility that NF-kB/Rel factor represents a new class of potential marker(s) for analysis of progression of breast disease. Importantly, since Rel factor activity is sensitive to treatment with a number of anti-oxidants, demonstration that NF-kB/Rel factors play a role in the etiology of breast cancer would provide a new therapeutic target for the treatment of breast disease.

DTIC

Etiology; Mammary Glands; Cancer

20010084639 General Accounting Office, Washington, DC USA

AIR POLLUTION: Air Quality and Respiratory Problems in and Near the Great Smoky Mountains

Walker, David M.; May 25, 2001; 20p; In English; The original document contains color images. Testimony before the Subcommittee on Legislative, Committee on Appropriations, House of Representatives

Report No.(s): AD-A390455; GAO-01-790T; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Good afternoon. It is a pleasure to be here in beautiful Asheville today to speak with you about the air we breathe. Western North Carolina has a well-justified reputation for beautiful mountains and diverse species of plants and animals. But air quality remains a concern. For about the past 6 months, we have been working with Chairman Charles H. Taylor on a study of air quality in this area. Today, we are releasing the results of that study. 1 But, before we get into the results, let me tell you a little bit about who we are. As the Comptroller General, I head the U.S. General Accounting Office or GAO. GAO is part of the legislative branch of government, and we help the Members of Congress carry out their constitutional responsibilities. We perform audits, investigations, evaluations, and policy analyses, and we provide a range of legal services that span the entire scope and reach of the federal government from Social Security issues to national security issues. Simply stated, our mission is to help the Congress make government work better for all Americans.

DTIC

Congressional Reports; Air Quality; Air Pollution; Respiratory System; Management Planning

20010084645 NASA Ames Research Center, Moffett Field, CA USA

The Influence of Sound Cues on the Maintenance of Temporal Organization in the Sprague-Dawley Rat

Winget, C. M., NASA Ames Research Center, USA; Moeller, K. A., San Jose State Univ., USA; Holley, D. C., San Jose State Univ., USA; [1994]; 1p; In English; 30th COSPAR Scientific Assembly, 11-21 Jul. 1994, Hamburg, Germany; Sponsored by Committee on Space Research, Unknown

Contract(s)/Grant(s): RTOP 106-50-05; No Copyright; Avail: Issuing Activity; Abstract Only

Temporal organization is a fundamental property of living matter. From single cells to complex animals including man, most physiological systems undergo daily periodic changes in concert with environmental cues (e.g., light, temperature etc.). It is known that pulsed Environmental synchronizers, zeitgebers, (e.g. light) can modify rhythm parameters. Rhythm stability is a necessary requirement for most animal experiments. The extent to which sound can influence the circadian system of laboratory rats is poorly understood. This has implications to animal habitats in the novel environments of the Space-Laboratory or Space Station. A series of three white noise (88+/-0.82 db) zeitgeber experiments were conducted (n=6/experiment). The sound cue was introduced in the circadian free-running phase (DD-NQ) and in one additional case sound was added to the usual photoperiod (12L:12D) to determine masking effects. Circadian rhythm parameters of drinking frequency, feeding frequency, and gross locomotor activity were continuously monitored. Data analysis for these studies included macroscopic and microscopic methods. Raster plots to visually detect entrainment versus free-running period, were plotted for each animal, for all three parameters, during all sound perturbation tested. These data were processed through a series of detrending (robust locally weighted regression analyses) and complex demodulation analyses. In summary, these findings show that periodic "white" noise "influences" the rats circadian system but does not "entrain" the feeding, drinking or locomotor activity rhythms.

Author

Regression Analysis; White Noise; Rats; Demodulation; Circadian Rhythms; Perturbation

20010084719 NASA Ames Research Center, Moffett Field, CA USA

Centrifugation of Cultured Osteoblasts and Macrophages as a Model to Study How Gravity Regulates The Function of Skeletal Cells

Globus, Ruth K., NASA Ames Research Center, USA; Searby, Nancy D., NASA Ames Research Center, USA; Almeida, Eduardo A. C., California Univ., USA; Sutijono, Darrell, NASA Ames Research Center, USA; Yu, Joon-Ho, NASA Ames Research Center, USA; Malouvier, Alexander, NASA Ames Research Center, USA; Doty, Steven B., Hospital for Special Surgery, USA; Morey-Holton, Emily, NASA Ames Research Center, USA; Weinstein, Steven L., San Francisco State Univ., USA; Dec. 29, 2000; 1p; In English; Future of Chronic Acceleration, 28-31 Jan. 2001, Davis, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Mechanical loading helps define the architecture of weight-bearing bone via the tightly regulated process of skeletal turnover. Turnover occurs by the concerted activity of osteoblasts, responsible for bone formation, and osteoclasts, responsible for bone resorption. Osteoclasts are specialized megakaryon macrophages, which differentiate from monocytes in response to resorption stimuli, such as reduced weight-bearing. Habitation in space dramatically alters musculoskeletal loading, which modulates both cell function and bone structure. Our long-term objective is to define the molecular and cellular mechanisms that mediate skeletal adaptations to altered gravity environments. Our experimental approach is to apply hypergravity loads by centrifugation to rodents

and cultured cells. As a first step, we examined the influence of centrifugation on the structure of cancellous bone in rats to test the ability of hypergravity to change skeletal architecture. Since cancellous bone undergoes rapid turnover we expected the most dramatic structural changes to occur in the shape of trabeculae of weight-bearing, cancellous bone. To define the cellular responses to hypergravity loads, we exposed cultured osteoblasts and macrophages to centrifugation. The intraosseous and intramedullary pressures within long bones in vivo reportedly range from 12-40 mm Hg, which would correspond to 18-59 gravity (g) in our cultures. We assumed that hydrostatic pressure from the medium above the cell layer is at least one major component of the mechanical load generated by centrifuging cultured cells. and therefore we exposed the cells to 10-50g. In osteoblasts, we examined the structure of their actin and microtubule networks, production of prostaglandin E2 (PGE2), and cell survival. Analysis of the shape of the cytoskeletal networks provides evidence for the ability of centrifugation to affect cell structure, while the production of PGE2 serves as a convenient marker for mechanical stimulation. We examined cell survival, reasoning that osteoblasts might mold skeletal structure in a hypergravity environment in part by regulating apoptosis and thus the duration of osteoblast productivity. Finally, we tested the influence of centrifugation on microbial activation of a macrophage cell line (RAW264.7). In response to the appropriate hormonal stimulation, this cell line is reportedly capable of undergoing differentiation to express osteoclast markers. In addition, a component of the cell wall of gram-negative bacteria, lipopolysaccharide (LPS), stimulates the formation of osteoclasts in vivo. Thus we tested the influence on centrifugation on RAW264.7 cells stimulated with LPS to provide an index of the function of osteoclast precursors.

Derived from text

Microorganisms; Osteoblasts; Centrifuging; Musculoskeletal System; Bone Demineralization; Bone Mineral Content; Macrophages; Cells (Biology)

20010084778 Los Alamos National Lab., NM USA

Role of Low Frequency Collective Modes in Biological Function: Ligand Binding and Cooperativity in Calcium-Binding Proteins

Trewhella, J.; 2001; 14p; In English

Report No.(s): DE2001-768788; LA-UR-00-5739; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The focus of this proposal was to study the low-frequency collective modes in proteins that have been widely discussed as potential means for direct control of biochemical processes. While it has been shown that protein dynamics are required for protein function, there is scant experimental data to establish a clear link between the specific details of the dynamics and control of a specific function. We used a combination of isotope labeling with Nuclear Magnetic Resonance (NMR) relaxation to probe the dynamic fluctuations within an individual domain of the calcium-binding protein calmodulin. Cellular functions are regulated via the actions of a number of messengers of which the divalent calcium ion is perhaps the simplest.

NTIS

Biochemistry; Calcium; Calmodulin; Ligands; Low Frequencies; Proteins

20010084923 NASA Goddard Space Flight Center, Greenbelt, MD USA

Echo the Bat and the Pigeon Adventure

Butcher, Ginger, NASA Goddard Space Flight Center, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 171-192; In English; See also 20010084895; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A multimedia, CD ROM to teach 2nd graders about remote sensing was created and developed into a web site. Distribution was expanded for Grades K-4 or 5-8. The idea was to have a story introduction, interactive story and a teacher's website. Interactive Multimedia Adventures in Grade School Education using Remote Sensing (I.M.A.G.E.R.S.) was created. The lessons are easy to use, readily available and aligned with national standards. This resource combines hands-on activities with an interactive web site

Derived from text

Education; Multimedia; Read-Only Memory Devices; Websites; Remote Sensing

20010085803 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Biological Terrorism: The Current Threat

Culpepper, Randy, Army Medical Research Inst. of Infectious Diseases, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 21-30; In English; See also 20010085800; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Bioterrorism is a very real threat to US civilians as we have seen an increased worldwide interest in bioterrorism over the past several years. Although the risk of a bioterrorism event occurring in any one location is low, the catastrophic consequences

from an event could be overwhelming. Our country is vulnerable to foreign and domestic terrorism and we must prepare to defend against biological weapons such as anthrax, smallpox, plague, and botulinum toxins. The first responders in a biological terrorist attack will be our healthcare providers in emergency rooms and primary care clinics. They must have a raised index of suspicion in the setting of mass casualties for the possibility of bioterrorism. The epidemiology of a bioterrorist event would be similar to that of naturally occurring diseases. Medical countermeasures such as pre- and post-exposure antibiotics are available against many of the bioterrorist agents and we must remember that some of the agents are highly transmissible person-to-person (e.g., small pox, pneumoni plague). A tiered laboratory response network is being established by the Centers for Disease Control and Prevention to aid in the rapid detection and diagnosis of biological terrorism agents.

Author

Emergencies; Medical Services

20010085934 Powderject Vaccines, Inc., Madison, WI USA

A Novel Gene Gun-Mediated IL-12 Gene Therapy for Breast Cancer Final Report, 15 Sep. 1996 - 14 Sep. 2000

Yang, Ning-Sun; Oct. 2000; 37p; In English

Contract(s)/Grant(s): DAMD17-96-2-6017

Report No.(s): AD-A392504; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of this study show that particle-mediated IL-12 gene therapy was effective against mammary tumors in mouse models. IL-12 gene therapy of the immunogenic TS/A adenocarcinoma resulted in regression of the established primary tumors and induction of immunological memory. This IL-12 gene therapy protocol for the poorly immunogenic 4T1 adenocarcinoma did not significantly affect the growth of the primary tumor, but could reduce spontaneous metastasis into the lungs. The anti-metastatic effect of IL-12 was not mediated by T cells, but involved NK cells and inteiferon gamma. In combination with IL-12 gene therapy, IL-18 and ICE genes were found to be more effective in treatment of established TS/A mammary tumor than IL-12 alone. These results suggest that particle-mediated IL-12 gene therapy, alone or in combination with other immunological approaches, may be effective for treatment of breast cancer. In a separate, but strategically relevant approach for cancer gene immunotherapy, a strong T cell- mediated anti tumor effect was demonstrated in mice vaccinated with a gene encoding the tumor-associated antigen gp100 in combination with a GM-CSF gene. These results have served as the pre-clinical data for a first clinical trial using cutaneous particle-mediated gene transfer, initiated at the University of Wisconsin.

DTIC

Cancer; Mammary Glands; Therapy; Genes

20010085935 Texas Univ., Medical Branch, Galveston, TX USA

Impact of Axillary Dissection on Clinical Outcomes of Breast Cancer Surgery Annual Report, 1 Jun. 1999 - 30 Jun. 2001

Du, Xianglin; Jun. 2001; 97p; In English

Contract(s)/Grant(s): DAMD17-99-1-9397

Report No.(s): AD-A392514; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

To determine whether failure to perform axillary dissection or irradiation is associated with decreased survival in women with early-stage breast cancer, we studied 26,290 women aged is greater than /-25 in 1988-93 from the Surveillance, Epidemiology and End Results (SEER) data and 5,328 women aged is greater than /- 65 in 1991-93 from SEER-Medicare data, who received BCS.

DTIC

Cancer; Mammary Glands; Surgery; Dissection; Mortality

20010085938 Henry Ford Health System, Detroit, MI USA

Molecular Epidemiology of Breast Cancer: Establishment of an at Risk Cohort and Methods to Improve the Collection and Use of Risk Factor Data Final Report, 15 Sep. 1996 - 30 Sep. 2000

Johnson, Christine C.; Oct. 2000; 186p; In English

Contract(s)/Grant(s): DAMD17-96-1-6246

Report No.(s): AD-A392530; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The objective of our research program was to develop a research infrastructure for studies defining molecular markers and their interaction with other factors as risk indicators for development of breast cancer among women with benign breast disease (BBD). We estimated the incidence of breast cancer development in African American and Caucasian women with biopsy-proven BBD and collected and archived in a specimen bank samples of benign breast disease lesions and breast cancer from women in this cohort. We also developed a culturally sensitive questionnaire for collecting breast cancer risk factor information. We constructed a cohort of women with BBD between 1981-1994 who were followed from 5-15 years and yielded 218 women who

developed invasive breast cancer. This work built the foundation, in terms of a cohort, a specimen bank and a survey instrument for the conduct of molecular epidemiologic studies of breast cancer in & multi-ethnic population.

DTIC

Cancer; Mammary Glands; Epidemiology; Ethnic Factors

20010085940 Rand Graduate Inst. for Policies Study, Santa Monica, CA USA

Incentives in a Specialty Care Carve-Out

Inkelas, Moira; Jan. 2001; 335p; In English

Report No.(s): AD-A392635; RAND-RGSD-158; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Most state Medicaid agencies are turning to capitated prepayment to contain costs, to improve access to care, and to increase efficiency in the provision of services. However, many states have concerns about how the financial incentives that accompany prepaid care could affect services to chronically ill beneficiaries. Medicaid agencies are implementing a variety of prepayment strategies specifically for children with chronic conditions, often intended to reduce financial disincentives for providing adequate care. They range from excluding certain services, to allowing voluntary enrollment in prepaid health plans for some children while requiring others to enroll. Some have questioned how these different policies will affect provider behavior, and how this in turn will affect the care that a child receives. California implemented a set of dramatic changes to the delivery of health care to Medicaid beneficiaries during the 1990's. Much of the policy debate over access to services focused on how to preserve specialty care access for children with complex medical diagnoses while also improving access to primary care to the general population. As California's ambitious plan to expand managed care unfolded in its largest counties, a legislative effort preserved the traditional role of the Social Security Act, Title V Children with Special Health Care Needs program in authorizing services under the traditional fee-for-service system. Child Medicaid beneficiaries who are eligible for Title V are those with complex medical diagnoses.

DTIC

Medical Services; Incentives; Chronic Conditions; Health; Insurance (Contracts)

20010086220 Texas Univ., M. D. Cancer Center, Houston, TX USA

Induction of Apoptosis in Human Breast Cancer by Adenoviral-Mediated Gene Transfer of the Transcription Factor E2F-1 Annual Report, 1 Aug. 1999-31 Jul. 2000

Hunt, Kelly, Texas Univ., USA; Aug. 2000; 20p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-97-1-7162

Report No.(s): AD-A389230; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We have previously shown that the transcription factor E2F-I results in apoptotic cell death in breast cancer cells when overexpressed in using an adenoviral-mediated system. In order to determine whether the E2F-1 transgene is effective in sensitizing cells to chemotherapy-induced apoptosis, we utilized a recombinant adenovirus in combination with Taxol or doxorubicin and evaluated our results using a two-dimensional isobologram statistical analysis. We observed marked synergistic growth inhibitory effects in breast cancer cell lines treated with a low-dose of adenovirus E2F-1 and low doses of Taxol or doxorubicin. In conclusion, adenovirus-mediated expression of E2F-1 can inhibit breast cancer cell growth synergistically in combination with low-dose Taxol. This combination of gene therapy and chemotherapy may lower the dose of chemotherapeutic agents necessary in the treatment of breast cancer patients and thus may reduce the adverse effects seen with chemotherapy treatments. We plan to explore this further in an animal model using breast cancer xenografts in nude mice.

DTIC

Chemotherapy; Cancer; Apoptosis; Adenoviruses; Cells (Biology); Mammary Glands

20010086242 Sandia National Labs., Albuquerque, NM USA

Spectroscopic Detection of Pathogens

Alam, M. K.; Timlin, J. A.; Martin, L. E.; Hjelle, B.; Lyons, R.; Nov. 2000; 20p; In English

Report No.(s): DE2001-771503; SAND2000-2929; No Copyright; Avail: Department of Energy Information Bridge

The goal of this LDRD Research project was to provide a preliminary examination of the use of infrared spectroscopy as a tool to detect the changes in cell cultures upon activation by an infectious agent. Due to a late arrival of funding, only 5 months were available to transfer and setup equipment at UTTM, develop cell culture lines, test methods of in-situ activation and collect kinetic data from activated cells. Using attenuated total reflectance (ATR) as a sampling method, live cell cultures were examined prior to and after activation. Spectroscopic data were collected from cells immediately after activation in situ and, in many cases for five successive hours. Additional data were collected from cells activated within a test tube (pre-activated), in both transmission mode as well as in ATR mode. Changes in the infrared data were apparent in the transmission data collected from the

pre-activated cells as well in some of the pre-activated ATR data. Changes in the in-situ activated spectral data were only occasionally present due to 1) the limited time cells were studied and 2) incomplete activation. Comparison of preliminary data to infrared bands reported in the literature suggests the primary changes seen are due an increase in ribonucleic acid (RNA) production. This work will be continued as part of a 3 year DARPA grant.

NTIS

Pathogens; Detection; Infrared Spectroscopy; Spectroscopic Analysis

20010086964 Yale Univ., New Haven, CT USA

Growth Factor Antagonism in Breast Cancer Chemotherapy Annual Report, 1 May 2000 - 30 Apr. 2001

Hamilton, Andrew D.; May 2001; 30p; In English

Contract(s)/Grant(s): DAMD17-99-1-9458

Report No.(s): AD-A392610; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The primary focus of this work is the identification of molecules that block the interaction of growth factors with their receptor tyrosine kinases (RTKs). We plan to design, synthesize and evaluate a novel series of synthetic agents that bind to the surface of growth factors and block their interaction with their RTKs. We have now prepared two classes of protein binding agents. The first involves the attachment of four peptide loops to a central scaffold based on the calix4arene unit. The second is based around a tetraphenylporphyrin unit in which different recognition groups are attached. We have identified one molecule that binds to the surface of platelet derived growth factor and shows potent antitumor activity in a mouse xenograft model of a human cancer that is activated by PDGF.

DTIC

Mammary Glands; Chemotherapy; Clinical Medicine; Cancer

20010087131 NASA Ames Research Center, Moffett Field, CA USA

Fundamental Biological Research on the International Space Station

Souza, K. A., NASA Ames Research Center, USA; Yost, Bruce, Lockheed Martin Space Mission Systems and Services, USA; Fletcher, L., Lockheed Martin Space Mission Systems and Services, USA; [2000]; 1p; In English; 51st International Astronautical Congress, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The fundamental Biology Program of NASA's Life Sciences Division is chartered with enabling and sponsoring research on the International Space Station (ISS) in order to understand the effects of the space flight environment, particularly microgravity, on living systems. to accomplish this goal, NASA Ames Research Center (ARC) has been tasked with managing the development of a number of biological habitats, along with their support systems infrastructure. This integrated suite of habitats and support systems is being designed to support research requirements identified by the scientific community. As such, it will support investigations using cells and tissues, avian eggs, insects, plants, aquatic organisms and rodents. Studies following organisms through complete life cycles and over multiple generations will eventually be possible. As an adjunct to the development of these basic habitats, specific analytical and monitoring technologies are being targeted for maturation to complete the research cycle by transferring existing or emerging analytical techniques, sensors, and processes from the laboratory bench to the ISS research platform.

Author

International Space Station; Life Sciences; Microgravity

20010087328 California Univ., San Francisco, CA USA

Structure-Based Design of Potent and Selective Inhibitors for Stromelysin-1 and MTI-MMP Annual Report, 15 May 2000 - 14 May 2001

Toba, Samuel; Jun. 2001; 10p; In English

Contract(s)/Grant(s): DAMD17-00-1-0192

Report No.(s): AD-A392520; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Matrix metalloproteinases (MMPs) is an important new class of therapeutic targets for the treatment of diseases characterized by excessive extracellular matrix degradation and/or remodeling, such as cancer. The inhibition of the MMPs enzymes can serve as disease-modifying agents. MMPs inhibitors help to prevent cancer metastasis and angiogenesis, and hence help stabilize the disease condition. In this research, we will apply structure- based drug design approach to find novel and selective biological probes of MMPs that may be effective cancer therapies. We have tested and validated the zinc metal ion force field for use in molecular docking, and accurately reproduced the experimental binding free energies for complexes of MMPs. Our docking studies of antineoplastic compounds have identified ligand binding preferences for the MMPs and the compounds selected are currently being assayed. In addition, we have investigated the induced fit mechanism in the active site of MMPs. The information

obtained will help us in the next stage of designing diverse and focused combinatorial libraries based on a known and a novel scaffold.

DTIC

Inhibitors; Therapy; Cancer; Enzymes; Matrix Materials

20010087789 Civil Aeromedical Inst., Civil Aeromedical Inst., Oklahoma City, OK USA

Assessment of Head-Injured Aircrew: Comparison of FAA and USAF Procedures Final Report

Fiedler, Edna; Orme, Daniel R.; Mills, William; Patterson, John C.; Jul. 2001; 9p; In English

Report No.(s): AD-A392805; DOT/FAA/AM-01/11; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The Federal Aviation Administration and the USA Air Force are similarly charged with determining whether aviators who have sustained head injuries are medically qualified to return to flying. The purpose of this paper is to first explain the major differences in missions between the USAF and the FAA, and then outline these procedures and rules, note their similarities and differences, address the strengths and weaknesses of each approach, and discuss the possible reconciliation of these differences. Finally, brief case material are presented to illustrate both evaluation methods.

DTIC

Head (Anatomy); Aircraft Pilots; Injuries

20010088089 Miami Univ., FL USA

Regulation of Sialomucin Complex Expression and its Effect on HER Receptor Interaction Annual Report, 15 Aug. 1999 - 14 Aug. 2000

Idris, Nebila; Carraway, Kermit; Sep. 2000; 71p; In English

Contract(s)/Grant(s): DAMD17-97-1-7151

Report No.(s): AD-A390702; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Sialomucin complex (SMC) is a heterodimeric glycoprotein complex consisting of a mucin subunit ASGP-1 (ascites sialoglycoprotein-1) and a transmembrane subunit ASGP-2, which can act as a ligand for the receptor tyrosine kinase ErbB2. SMC is a highly expressed protein on the surface of ascites 13762 rat mammary adenocarcinoma cells, approximately 102 times the level in lactating mammary gland and 10(exp 4) times that in virgin mammary gland. SMC is largely post-transcriptionally regulated in developing mammary gland. SMC can be post-transcriptionally regulated in normal cultured rat mammary epithelial cells (MEC) but not 13762 ascites tumor cells by Matrigel by inhibition of SMC precursor synthesis. SMC is also post-translationally regulated by TGF-beta by inhibition of SMC precursor processing into mature ASGP-1 and ASGP-2. Interestingly, SMC levels in 13762 ascites tumor cells are unaffected by TGF-beta. SMC and ErbB-2 have similar expression patterns in normal developing mammary gland and can be found in a complex in virgin as well as lactating mammary tissue. Thus, SMC is regulated by two novel post-transcriptional mechanisms in normal mammary epithelial cells but not 13762 tumor cells and its complex formation with the receptor ErbB-2 may play some role in mammary development and differentiation.

DTIC

Mammary Glands; Proteins; Gene Expression; Clinical Medicine

20010088365 Institute of Space Medico-Engineering, Beijing, China

Effects of Heat Stress on DA Mediated PI Signal Transduction System in Rat Striatum

Zhao, Ya-Li, Institute of Space Medico-Engineering, China; Xing, Cheng, Institute of Space Medico-Engineering, China; Lu, Zhi-Zhong, Institute of Space Medico-Engineering, China; Wang, Lu-Ming, Institute of Space Medico-Engineering, China; Li, Jian-Dong, Institute of Space Medico-Engineering, China; Zhao, Yong-Qi, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 116-120; In Chinese; Copyright; Avail: Issuing Activity

Objective: to study the effects of heat stress on dopamine (DA) and related phosphatidylinositol (PI) signal transduction system members: PLA2, PI, Ca(2+) in rat striatum. Method: Male Wistar rats were randomly divided into control group and heat stressed group. Heat stressed rats were placed in small hot chambers and taken out as soon as their rectal temperatures (Tr) reached the preset temperature. Then the animals were killed and their striatums were taken out. Fluorospectrophotometry, HPLC, Fura-2/AM fluorescence labelled method and acidalkaline titration were used to measure the content of DA, PI, [Ca(2+)]i and the enzyme activity of PLA2. Result: During heat stress, when rats' Tr reached 41 C or higher, with increase of Tr, DA content increased continuously. When Tr = 43.0 C, DA content was significantly higher than control. When Tr = 41.0 C PLA2 activity was higher than control significantly, PI content of heat stressed group decreased significantly than control. [Ca(2+)]i increased significantly when Tr = 42.0 C as compared with control. But if DA receptor2 (D2R) antagonist was given an hour before heat stress, [Ca(2+)]i decreased and Tr took a longer time to get to 42.0 C. Conclusion: During heat stress, DA mediated PI signal

transduction system was activated. The increase of $[Ca^{2+}]_i$ might be mediated by D2R, and D2R antagonist may improve thermotolerance.

Author

Temperature Effects; Heat Tolerance; Thermoregulation; Dopamine; Enzyme Activity

20010088367 Air Force General Hospital, Clinical Aeromedical Center, Beijing, China

Experimental Studies of the Protective Effects of Basic Fibroblast Growth Factor and Radix Salviae Miltiorrhizae on Brain Injury in Rats Caused by Repeated Exposures +Gz

Liu, Hong-Jin, Air Force General Hospital, China; Cai, Qing, Air Force General Hospital, China; Ji, Gui-Ying, Air Force General Hospital, China; Wang, Zhe, Air Force General Hospital, China; Jiang, Jian-Dong, Air Force General Hospital, China; Zhu, Mei-Cai, Air Force General Hospital, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 137-139; In Chinese; Copyright; Avail: Issuing Activity

Objective: to investigate the preventive and therapeutic effects of basic fibroblast growth factor (bFGF) and Radix Salviae Miltiorrhizae (RSM) on brain injury caused by repeated +Gz exposures. Method: bFGF and RSM were injected intraperitoneally into SD rats before and after repeated +Gz exposures. The contents of excitatory amino acids (EAAs), nitric oxide (NO) and the number of cell apoptosis in the brain were measured, and were compared to those of the control group and normal saline (NS) group. Result: The contents of EAAs, NO and the number of cell apoptosis were significantly higher in repeated +Gz exposures group than those in control group. The values were markedly lower in bFGF and RSM group than those in repeated +Gz exposures group and NS group. Conclusion: bFGF and RSM showed distinct preventive and therapeutic effect on the brain injury induced by repeated +Gz exposures.

Author

Fibroblasts; Exposure; Apoptosis; Amino Acids; Nitric Oxide

20010089346 Stanford Univ., Hopkins Marine Station, Pacific Grove, CA USA

The Genetic Dissection of Biomineralization: Coccolith Formation by Coccolithophore Algae Final Report, 1 Mar. 1996 - 31 Dec. 1999

Levine, R. P.; Mar. 06, 2001; 3p; In English

Contract(s)/Grant(s): N00014-96-1-0529

Report No.(s): AD-A387411; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Research established that the organic material of the coccoliths consists of proteins, glycoproteins, and polysaccharides are found in preparations of isolated coccoliths. It was determined that the organic material affects crystal nucleation, post-nucleation crystal growth, and the architecture of the crystals. Results were obtained by light and scanning electron microscopy. It was determined that the coccoliths organic material contains to a-binding proteins and to isolated and purify the proteins. We demonstrated that these protein have specific effects of the growth and form of crystals formed in solution as determined by a combination of light and scanning electron microscopy and atomic force microscopy.

DTIC

Algae; Crystal Growth; Dissection; Genetics; Phytoplankton; Proteins

20010089369 RAND Corp., Santa Monica, CA USA

Prenatal Cocaine Exposure Scientific Considerations and Policy Implications

Wenzel, Suzanne L.; Kosofsky, Barry E.; Harvey, John A.; Iguchi, Martin Y.; Steinberg, Paul; Jan. 2001; 50p; In English

Report No.(s): AD-A392543; RAND/MR-1347-DPRC; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Prenatal exposure to drugs, including cocaine, is a significant and preventable cause of developmental disability. Almost two decades after the nation first heard stories of "crack babies," new research has shown that children exposed to cocaine before birth are at risk of learning and behavioral problems. Such problems have broad implications for education, social welfare, and criminal justice in the USA. This report presents an overview of the current state of knowledge regarding the effects of cocaine on the developing brain and offers policy considerations for addressing the issues that arise from cocaine use by pregnant women. Most of the scientific research discussed in the report is derived from a 1997 New York Academy of Sciences conference on "Cocaine: Effects on the Developing Brain," the proceedings of which have been published as Volume 846 of the Annals of the New York Academy of Sciences (Harvey and Kosofsky, 1998). The policy implications discussed here are based on material presented at this conference and on investigations conducted by researchers at RAND.

DTIC

Drugs; Exposure

20010089371 Albany Medical Coll., NY USA

PAI-1 Gene as a Target for Breast Cancer Therapy *Annual Report, 1 Apr. 2000 - 31 Mar. 2001*

Higgins, Paul J.; Apr. 2001; 15p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD19-98-1-8015

Report No.(s): AD-A392548; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of work in year 03 of this study was to continue to define the in vitro growth characteristics of stable cell lines of human breast carcinoma cells (developed in year 01 and continuing into year 02) that synthesized varying levels of plasminogen activator inhibitor type-1 (Pai-1) as a result of transfection with expression vectors bearing PAI-1 cDNA inserts cloned in the sense and antisense orientations. A complete panel of 32 such genetically-engineered epithelial cell lines was created and each of these were assessed with regard to their ability to (1) locomote across a planar surface following scrape-injury of confluent monolayers (directed cell migration) and (2) exhibit invasive growth behavior in three-dimensional motility chamber assays. PAI-1 expression was required for epithelial cell migration in directed assays since antisense targeting effectively suppressed induced cell locomotion. A unique expression vector consisting of a PAI-1-GFP chimeric protein driven by PAI-1 promoter sequences was used to conclusively demonstrate PAI-1 deposition into cellular migration tracks. A "window" of PAI-1 expression was found to be necessary to support optimal breast cancer locomotion and invasive migration. Work in the final year will test this hypothesis in vivo.

DTIC

Genes; Mammary Glands; Therapy; Clinical Medicine

52

AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

20010083357 NASA Ames Research Center, Moffett Field, CA USA

NASA SMART Probe: Breast Cancer Application

Mah, Robert W., NASA Ames Research Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

There is evidence in breast cancer and other malignancies that the physiologic environment within a tumor correlates with clinical outcome. We are developing a unique percutaneous Smart Probe to be used at the time of needle biopsy of the breast. The Smart Probe will simultaneously measure multiple physiologic parameters within a breast tumor. Direct and indirect measurements of tissue oxygen levels, blood flow, pH, and tissue fluid pressure will be analyzed in real-time. These parameters will be interpreted individually and collectively by innovative neural network techniques using advanced intelligent software. The goals are 1) develop a percutaneous Smart Probe with multiple sensor modalities and applying advanced Information Technologies to provide real time diagnostic information of the tissue at tip of the probe, 2) test the percutaneous Smart Probe in women with benign and malignant breast masses who will be undergoing surgical biopsy, 3) correlate probe sensor data with benign and malignant status of breast masses, 4) determine whether the probe can detect physiologic differences within a breast tumor, and its margins, and in adjacent normal breast tissue, 5) correlate probe sensor data with known prognostic factors for breast cancer, including tumor size, tumor grade, axillary lymph node metastases, estrogen receptor and progesterone receptor status.

Author

Cancer; Mammary Glands; Physiology; Probes

20010083585 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France

Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options *les Medicaments pour les equipages militaires: Consommation actuelle, questions et strategies pour des options elargies*

Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001; 166p; In English; See also 20010083586 through 20010083603; CS-ROM contains full text document in PDF format

Report No.(s): RTO-TR-014; AC/323(HFM-014)TP/14; ISBN 92-837-1063-0; Copyright Waived; Avail: CASI; C01, CD-ROM; A08, Hardcopy; A02, Microfiche

Working Group 26 evaluated issues pertaining to expanding the range of medications available for use in military aircrew. Working Group 26 completed its work under the auspices of the Human Factors and Medicine Panel of the NATO Research and Technology Agency. The group conducted a survey of medication use policies among NATO air forces and presents the data. The

group also reviewed the current state of aeromedical issues for treatment of certain commonly encountered conditions in military aircrew. The working group also presents discussions of the general approaches to determining the suitability of medication for use in military aircrew for therapeutic indications and for operational indications. The ethics of such decisions in military aerospace medicine are also discussed. The best means for evaluating specific areas of aeromedical concern when studying medication are presented. Medications identified as candidates for immediate study for the benefit of military aircrew and their air forces are used for hypertension, lipid disorders, depression, anxiety disorders, malaria prevention, promotion of performance during prolonged sleepless periods, and promotion of sleep for short periods of time to support sustained operations. The working group provides recommendations to enhance knowledge between nations about aeromedical research on medications effects and aeromedical experience with medication. The group proposes use of cooperative research between nations to accelerate the process of answering questions about aeromedically significant side effects and expand the range of medications available for use in military aircrew.

Author

Aerospace Medicine; Flight Crews; Drugs; Pharmacology; Human Factors Engineering

20010083586 Air Force Special Operations Command, 16th Medical Group, Hurlburt Field, FL USA

Medication for Military Aircrew: Current Use, and Strategies for Expanded Options - Introduction

Ediger, Mark, Air Force Special Operations Command, USA; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 1-4; In English; See also 20010083585; Copyright Waived; Avail: CASI; A01, Hardcopy

Working Group 26 was originally chartered by the AGARD Aerospace Medicine Panel to study issues relating to use of medications in military aircrew. The group began its work in April, 1997 and was charged to continue its work by the newly created NATO Research and Technology Organization in 1998 following the dissolution of AGARD. Working Group 26 has completed its work under the auspices of the Human Factors and Medicine Panel.

Author

Aerospace Medicine; Flight Crews; Human Factors Engineering; Drugs

20010083587 Air Force School of Aerospace Medicine, Brooks AFB, TX USA

Antihypertensive Drugs In Aircrew

Pickard, Jeb S., Air Force School of Aerospace Medicine, USA; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 5-14; In English; See also 20010083585; Copyright Waived; Avail: CASI; A02, Hardcopy

Chronic diseases are relatively rare in the military aviator population, but essential hypertension is a distinct exception. Estimates of prevalence vary considerably, in part due to the typical liability of early hypertension in the young to middle-aged, predominantly Caucasian population characteristic of NATO air forces. Suffice it to say that, for most services, antihypertensive drugs represent some of the most common, if not the commonest, waivers for chronic medication use in aviation personnel.

Author

Antihypertensive Agents; Hypertension; Drugs; Aircraft Pilots

20010083588 Defence and Civil Inst. of Environmental Medicine, Toronto, Ontario Canada

Pharmacologic Agents for the Management of Asthma in Aircrew

Gray, G. W., Defence and Civil Inst. of Environmental Medicine, Canada; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 21-26; In English; See also 20010083585; Copyright Waived; Avail: CASI; A02, Hardcopy

Asthma is an inflammatory condition of the airways, producing variable bronchoconstriction. First line therapy is directed at controlling the inflammatory process with agents such as inhaled steroids, nedocromil, and the newer leukotriene inhibitor drugs. In severe cases, systemic steroids or other immunosuppressive therapies may be required for suppression of inflammation. Other agents provide symptomatic relief of bronchospasm. Short-acting beta-agonists are the mainstay for providing relief of acute episodes. Anticholinergic inhaled agents have a minor role in acute episodes. Long-acting beta-agonists are used to smoothe long-term symptom control and help reduce the frequency of acute episodes when combined with inhaled steroids. Theophylline has bronchodilator properties and may have antiinflammatory properties, but has a narrow therapeutic window. Other newer agents are currently being developed, including anti-immunoglobulin E, antitryptase and anti-CD4 agents. These newer agents may expand the options for control of asthma over the next decade. The prevalence of asthma has been increasing in recent years, and occurs not uncommonly in an aviator population. Evaluation of aircrew requires a comprehensive respiratory assessment, including a detailed history of symptoms, triggering factors, and past treatment requirements, and a pulmonary function

assessment with evaluation of bronchial reactivity. The challenge for the flight surgeon is to define as clearly as possible the severity of the disease, and to control the condition with agents acceptable for continuing aircrew duties. Good control of the inflammatory process with inhaled steroids alone, while minimizing or eliminating the need for bronchodilators, may allow continuing available for the control of asthma from an aeromedical perspective. Reference (17) is a website providing excellent background information for both patients and physicians on asthma. Reference (10) provides a more comprehensive overview of the assessment and treatment of asthma in aircrew. In fast-jet aircrew, any degree of asthma is generally unacceptable because varying degrees of small-airway dysfunction may predispose to airway collapse with +Gz, thus contributing to both acceleration atelectasis and aggravation of the ventilation/perfusion mismatch induced by G. In non fast-jet aircrew, stability of bronchial reactivity and full control of asthmatic symptoms with acceptable medications is the prime objective. Aircrew whose airway reactivity is normalized and well-controlled on acceptable medications may be considered for continuing duties.

Author

Respiratory Physiology; Asthma; Flight Crews; Drugs; Pharmacology

20010083589 National Defence Headquarters, Ottawa, Ontario Canada

H1-Antihistamines and Aircrew

Davidson, Ronald A., National Defence Headquarters, Canada; Nicholson, Anthony N., Defence Evaluation Research Agency, UK; Stone, Barbara M., Defence Evaluation Research Agency, UK; Pickard, Jeb S., Air Force School of Aerospace Medicine, USA; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 27-30; In English; See also 20010083585; Copyright Waived; Avail: CASI; A01, Hardcopy

For many years it was accepted that antihistamines were among the safest medications in the world, and this reputation was enhanced by the development of the so-called second generation compounds, which were largely free of adverse effects on vigilance and performance. It was against this background that there was wide agreement that they could be used safely by aircrew. However, cardiotoxicity has now become an issue with these antihistamines, and the confidence which was once placed in their use for aircrew requires re-examination. With certain antihistamines, plasma concentrations of the parent compound, caused by overdosage, inhibition of metabolism, or hepatic insufficiency, may lead to prolongation of the QT(sub c) interval, and thus to ventricular dysrhythmias similar to those seen with quinidine. Such dysrhythmias are likely due to blockade of the rapidly activating component (I(sub Kr)) of the delayed rectifier potassium channel, since inhibition of this channel is common to virtually all drugs that prolong the QT interval.² There is no evidence of any correlation between I(sub Kr) inhibition and antihistamine potency or H1 receptor blockade.

Derived from text

Antihistaminics; Drugs; Flight Crews; Aerospace Medicine

20010083590 Italian Air Force, Inst. for Aeromedical Evaluation, Rome, Italy

Endocrine Drugs in Aircrew

Danese, Daniele, Italian Air Force, Italy; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 31-42; In English; See also 20010083585; Copyright Waived; Avail: CASI; A03, Hardcopy

Hormones are molecules that are synthesized and secreted by groups of cells clustered in specific tissues, usually known as glands, and are released into the blood, exerting biochemical effects on target cells at a distance from their site of origin. Hormones are chemical messengers, endogenous compounds that are involved in both intracellular and extracellular communication. The site of action is determined by the presence of specific hormone receptors on or in target cells. Hormones have diverse molecular structures, as summarized in Table 1. Historical interest in hormonal effects is ancient;^{1,3} the physiological and morphological effects of accidental or intentional castration of man or domestic animals were known to be correlated with the loss of testes. Later, transplanted testes were demonstrated to prevent development of capon characteristics in the castrated rooster, and later still it was shown that testicular extracts, and finally testosterone itself, corrected the deficit. Similar discoveries were made concerning the ovary, the adrenal, and the thyroid, through the classic experiments of surgical extirpation and replacement. In the beginning, hormonal therapy was developed by using natural substances extracted from animal or human organs, but now these have been almost entirely supplanted by synthetic hormones. Worldwide prevalence of endocrine disorders varies significantly. Certain endocrine conditions are among the most prevalent diseases in general medicine, particularly diabetes mellitus, obesity, and thyroid disorders. In clinical endocrinology practice, the most common endocrine diseases are diabetes mellitus, thyrotoxicosis, hypothyroidism, nodular goiter, diseases of the pituitary gland and diseases of the adrenal gland. This monograph will focus mainly on three hormonal therapeutic agents: adrenal hormones, insulin, and thyroid hormones. Hypothalamic and pituitary

hormones will not be considered, since they are used primarily in diagnostic procedures, and only very rarely for medical treatment.

Derived from text

Endocrine Systems; Endocrine Glands; Hormones; Flight Crews; Drugs

20010083591 Italian Air Force, Inst. for Aeromedical Evaluation, Rome, Italy

Gastrointestinal Drugs in Aircrew

Danese, Daniele, Italian Air Force, Italy; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 43-46; In English; See also 20010083585; Copyright Waived; Avail: CASI; A01, Hardcopy

Gastrointestinal diseases (GID) are common disorders in the general population. More than 50% of patients presenting with GID complaints are in the decades of life typical of military personnel, and GID represent some of the commonest reasons for medication waivers in military aircrew. The clinical course of most gastrointestinal disorders tends to be chronic, with unpredictable remissions and relapses, and a propensity for complications which may be acutely disabling or may chronically worsen the individual's general health. The development of GID by aviation personnel often leads to variable degrees of limitation in their flying duties, largely depending on the natural history of the disorder. The most common GID of aeromedical interest are: gastroesophageal reflux; peptic ulcer, both gastric and duodenal; chronic inflammatory disease of the bowel, predominantly regional enteritis and ulcerative colitis; and irritable bowel. Pharmacologic agents to treat GID include many of the most commonly used drugs in medicine, including antacids, histamine H2-receptor blocking agents, anticholinergics, proton pump inhibitors, antimotility agents, and antibacterials.

Derived from text

Gastrointestinal System; Flight Crews; Drugs; Aerospace Medicine

20010083592 Service de Medecine Aeronautique, Centre Principal d'Expertise Medicale du Personnel Mavigant, Clamart, France

Malaria Chemoprophylaxis in Military Aircrew

Paris, Jean-Francois, Service de Medecine Aeronautique, France; Gourbat, Jean Pierre, Service de Medecine Aeronautique, France; Doireau, Phillipe, Service de Medecine Aeronautique, France; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 47-56; In English; See also 20010083585; Copyright Waived; Avail: CASI; A02, Hardcopy

Malaria prophylaxis of aircrew is one of the more frequent problems with which a flight surgeon has to cope. This article examines the aeromedical aspects of the topic by reviewing the indications and side effects of the available chemoprophylactic drugs. A potential for neurosensory side effects constitutes the most frequent reason to reject the use of a particular drug. Knowledge about malaria prophylaxis is in a constant state of change; thus, recommendations are liable to become rapidly outmoded. Whatever the chosen drug, chemoprophylaxis should always be integrated into a global management strategy which includes antivector measures on an individual and collective scale.

Author

Aerospace Medicine; Flight Crews; Parasitic Diseases; Prophylaxis

20010083593 Defence Evaluation Research Agency, Centre for Human Sciences, Farnborough, UK

Drugs and Air Operations

Nicholson, Anthony N., Defence Evaluation Research Agency, UK; Stone, Barbara M., Defence Evaluation Research Agency, UK; Turner, Claire, Defence Evaluation Research Agency, UK; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 57-66; In English; See also 20010083585; Copyright Waived; Avail: CASI; A02, Hardcopy

There can be little doubt that the performance of air personnel may deteriorate during intensive and sustained operations, and much thought has been given to the use of hypnotics to preserve sleep, and stimulants to enhance vigilance. The effect of these two possibilities may be complementary. Stimulants may be particularly useful for critical periods of work likely to involve impaired performance when used against a background of hypnotics to ensure adequate sleep in limited rest periods. However, the use of hypnotics and stimulants demands the most careful evaluation of each individual drug, and of their interactions. In the case of hypnotics the overriding consideration, assuming efficacy, is duration of action which is dependent on the dose and the pharmacokinetic profile. Determination of the minimal dose is essential. Information on the pharmacokinetic profile is useful, though it is not possible to predict duration of action from such data with any certainty. It is often implied that the elimination half-life determines the duration of action, but duration of action also depends on rate of absorption and distribution, and so all three phases of the pharmacokinetic profile, as well as the minimum effective concentration for a particular effect, are involved.

It is essential to carry out experimental studies to determine the minimum dose to produce sleep during a limited period of rest, and to ensure that impairment of performance does not extend into the work period.

Derived from text

Flight Crews; Pharmacology; Amphetamines; Central Nervous System Stimulants

20010083594 Service de Medecine Aeronautique, Clamart, France

Melatonin and Aircrew: Is an Operational Use Recommended?

Doireau, Phillipe, Service de Medecine Aeronautique, France; Paris, Jean-Francois, Service de Medecine Aeronautique, France; Gourbat, Jean Pierre, Service de Medecine Aeronautique, France; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 67-72; In English; See also 20010083585; Copyright Waived; Avail: CASI; A02, Hardcopy

The time difference-related desynchronization syndrome commonly called "jet lag" raises many issues in terms of performance and flight safety during rapid military deployments. Of several physical and pharmacological solutions recently proposed, the use of melatonin is generally considered to be a promising coping strategy. In this literature review, the authors have highlighted practical unsolved considerations in the use of melatonin. A conservative attitude, especially about its use in aircrew, currently remains necessary because of the lack of scientific certainties.

Author

Flight Crews; Hormones; Pharmacology; Jet Lag; Desynchronization (Biology)

20010083595 Royal Air Force Inst. of Aviation Medicine, Farnborough, UK

Medication for Motion Sickness

Benson, Alan, Royal Air Force Inst. of Aviation Medicine, UK; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 73-88; In English; See also 20010083585; Copyright Waived; Avail: CASI; A01, Hardcopy

Over the years many medicinal remedies have been proposed for the prevention of motion sickness. The number of drugs that has been tested is large, but relatively few are effective, and none can completely prevent the development of signs and symptoms in everyone in all provocative motion environments. When the motion is relatively mild and only 10% of the unmedicated population suffer from sickness, then use of a drug such as hyoscine (scopolamine) can increase protection so that all but 2% of the population remain symptom-free. But when the motion is of such severity and duration that 50% are sick when no drug is given, a large dose of hyoscine (1.0mg) still leaves 8% of the population unprotected. In life-rafts, sickness rates approaching 100% have been reported, so it is not surprising that a significant proportion of the occupants will still suffer from sea sickness even when the dose of drug given is sufficient to cause side-effects. None of the drugs of proven efficacy in the prophylaxis of motion sickness is entirely specific and all have side-effects. Both the anti-histaminics (such as promethazine, dimenhydrinate or cinnarizine) and the anti-cholinergic, hyoscine, are also central depressants and can cause impairment of performance. Hyoscine, at all therapeutic doses, has been shown to cause a performance decrement on tasks requiring continuous attention and memory storage for new information, but only at doses greater than 0.8mg does it interfere with performance of a pursuit tracking task. Promethazine 25mg and cinnarizine at doses greater than 30 mg have also been shown to impair psychomotor performance. Other side effects of hyoscine, notably blurred vision, sedation, dizziness and dry mouth, may also contribute to performance decrement.

Derived from text

Drugs; Motion Sickness; Physiological Effects; Pharmacology

20010083596 Royal Netherlands Air Force, Health Care Services, The Hague, Netherlands

Medication Database

Lam, Berry, Royal Netherlands Air Force, Netherlands; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 89-108; In English; See also 20010083585; Copyright Waived; Avail: CASI; A03, Hardcopy

In April 1997, Working Group 26 undertook to facilitate international collaboration in determining the suitability of medications for use by military aviators. The group is focusing on two areas: 1) current knowledge and experience in use of medications by military aviators, and 2) means of international collaboration on the study of new medications for use by military aviators. To simplify the task, while still including the vast majority of drugs used in aviators, the group discussion decided to focus on eight disease categories: Hypertension, Malaria Prophylaxis, Asthma, Allergic Rhinitis, Allergic Dermatitis, Other

Manifestations of Allergy, Hyperlipidaemia and Disorders of the Digestive System. Furthermore it was decided to see which drugs for operational use were thought to be important.

Derived from text

Data Bases; Aerospace Medicine; Drugs

20010083597 Air Force Special Operations Command, 16th Medical Group, Hurlburt Field, FL USA

Ethical Considerations in Use of Medications by Military Aircrew

Ediger, Mark, Air Force Special Operations Command, USA; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 109-112; In English; See also 20010083585; Copyright Waived; Avail: CASI; A01, Hardcopy

Those who make decisions employ a moral component in the process of rationalizing a chosen course of action - ethics. Military flight surgeons often find themselves making decisions involving competing interests, those of the military service whose mission they support (and by whom the flight surgeon is generally employed), and the best interests of the individual military aviator with whom exists a physician-patient relationship. In this respect, military flight surgeons and occupational medicine physicians share a common challenge. However, when the employer is a military service and the employee/patient is a military aviator, the ethical issues for the physician take on added dimensions beyond those typically encountered in the practice of occupational medicine.

Author

Aircraft Pilots; Ethics; Flight Surgeons; Drugs

20010083598 Air Force School of Aerospace Medicine, FECL, Brooks AFB, TX USA

Approach to Aeromedical Drug Evaluations

Pickard, Jeb S., Air Force School of Aerospace Medicine, USA; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 113-116; In English; See also 20010083585; Copyright Waived; Avail: CASI; A01, Hardcopy

Therapeutic drugs acceptable for military aviation are those agents which, without significantly affecting occupational proficiency and safety, may be administered to aviators to alleviate disease which is not itself disqualifying for aviation, or which may allow return to flying status as a result of therapy. This is in contrast to operational medications, pharmacologic agents administered to healthy members to enhance force effectiveness in areas as diverse as vigilance, performance enhancement, Circadian adaptation, and prophylaxis. As a rule, while operational medications may be an issue in any military member, therapeutic agents are of particular concern only in aviation or other high-performance, high-risk occupations, where subtle alterations in psychologic or physiologic performance might have profound effects on performance or safety. For other military members, the standard assessment of clinical efficacy and tolerability which occurs prior to the marketing of a therapeutic agent is usually sufficient for treatment decisions. In the case of operational medications, subtle drug-induced alterations in the aviator are certainly of interest as well, but the relative lack of clinical experience and medical literature means that, as a rule, even the most basic questions of efficacy and safety need to be answered first.

Author

Aerospace Medicine; Aircraft Pilots; Drugs; Pharmacology

20010083599 Service de Medecine Aeronautique, Clamart, France

Gold Standard Tests

Doireau, Philippe, Service de Medecine Aeronautique, France; Pickard, Jeb S., Air Force School of Aerospace Medicine, USA; Lam, Barry, Royal Netherlands Air Force, Netherlands; Gray, Gary W., Defence and Civil Inst. of Environmental Medicine, Canada; Eliopoulos, Themis, Greece; Roedig, Erich, Germany; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 117-138; In English; See also 20010083585; Copyright Waived; Avail: CASI; A03, Hardcopy

While drug toxicity which targets internal, especially excretory, organs is aggressively evaluated in laboratory and clinical trials prior to marketing, adverse effects on systems of interest to aviation, e.g., the special senses, are only rarely evaluated. It is the intent of this guideline to recommend tests which have been successfully employed in earlier research to detect medication effects. Where that proved impossible, tests were chosen that were known to be sensitive in detecting abnormalities typically caused by medications (e.g., contrast sensitivity function for visual abnormalities). Also, tests with a history of use in clinical medicine were preferred, since they were more likely to be available, well validated, and familiar to potential investigators, although for some areas such as cognitive testing this was impractical. Since baseline testing should be readily available when investigating drug effects, tests with a higher degree of sensitivity and reproducibility were preferred to those with greater

specificity. Note that some tests have been discussed, not necessarily to be recommended. Also, even for those tests that are recommended, we do not mean to imply that all tests be done on all drugs; the testing regimen should be tailored to potential areas of concern. The following sections are arranged by physiologic category, consisting of cognitive functions, special senses, critical organs, and physiologic responses to environmental demands such as acceleration.

Author

Physiological Responses; Drugs; Clinical Medicine; Physiological Tests; Aerospace Medicine

20010083600 Air Force School of Aerospace Medicine, FECL, Brooks AFB, TX USA

Losartan Potassium: A Review of Its Suitability for Use in Military Aircrew

Pickard, Jeb S., Air Force School of Aerospace Medicine, USA; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 139-144; In English; See also 20010083585; Copyright Waived; Avail: CASI; A02, Hardcopy

The renin-angiotensin system (RAS) plays a central role in the control of blood pressure, and in particular it is felt to play a crucial role in neurogenic hypertension. The RAS appears to act through two mechanisms, affecting the acute control of blood pressure through the pressor action of angiotensin II, and the long-term regulation of cardiovascular remodeling through the growth factor properties of angiotensin II.

Derived from text

Flight Crews; Vasoconstrictor Drugs; Aerospace Medicine; Hypertension

20010083601 Air Force School of Aerospace Medicine, FECL, Brooks AFB, TX USA

Losartan Potassium: Evaluating the Treated Aviator for Medical Waiver

Pickard, Jeb S., Air Force School of Aerospace Medicine, USA; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 145-146; In English; See also 20010083585; Copyright Waived; Avail: CASI; A01, Hardcopy

A review of the literature concerning losartan has shown it to be a potential candidate for use in aircrew. Based on clinical studies and postmarketing surveillance, no side effects have been uncovered that would preclude aviator use a priori. However, a number of questions remain to be addressed before deciding whether losartan is suitable for use in military aviation. For example, data is either lacking or scant concerning cognitive, vestibular, and acceleration effects, to name a few.

Derived from text

Aircraft Pilots; Aerospace Medicine; Vasoconstrictor Drugs; Pharmacology

20010083602 Air Force Special Operations Command, 16th Medical Group, Hurlburt Field, FL USA

Current Use of Medications in NATO Military Aircrew

Ediger, Mark, Air Force Special Operations Command, USA; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 147-152; In English; See also 20010083585; Copyright Waived; Avail: CASI; A02, Hardcopy

The collection of data from NATO nations regarding use of medications for aircrew contains some interesting information and is a tool of great potential utility to NATO flight surgeons. In our survey of therapeutic medications use, we concentrated on medications used for long-term or sustained therapy for medical conditions. We did not survey nations on short-term therapeutic agents such as antibiotics. As we stated in the introduction, there is a growing requirement to expand the range of medications available for use in aircrew. Allow me to repeat the list of factors driving these requirements: 1) Rapid expansion of the number of new drugs available for clinical indications, offering enhanced disease management; 2) Diminished funding for research making it difficult for any single nation to completely evaluate aeromedical issues for one or more drugs; 3) Sustained round-the-clock operations and rapid deployment across multiple time zones; 4) Increased emphasis on mitigating the risk of chronic disease development through early intervention and improved disease management to reduce risk of disease complications; 5) Focus on population-based medicine leading to the understanding that consistently sound disease management, often involving newer pharmacologic agents, will maintain higher qualification rates in the aviation force; 6) Emphasis on force protection and emerging infectious disease threats increases demand for effective pharmacologic prophylaxis; and 7) Absence of information on aeromedically significant.

Derived from text

Aerospace Medicine; Drugs; Flight Crews; North Atlantic Treaty Organization (NATO); Pharmacology

20010083603 Institut de Medicine Aerospatiale Armee, Dept. of Physiology, Bretigny sur Orge, France

Modafinil: A Molecule of Military Interest

Pierard, C., Institut de Medicine Aerospatiale Armee, France; Lallement, G., CRSSA, France; Peres, M., Institut de Medicine Aerospatiale Armee, France; Lagarde, D., Institut de Medicine Aerospatiale Armee, France; Medication for Military Aircrew: Current Use, Issues, and Strategies for Expanded Options; June 2001, pp. 77-88; In English; See also 20010083585; Copyright Waived; Avail: CASI; A03, Hardcopy

Modafinil (Modiodal(R)) is a synthetic molecule prescribed for the treatment of narcolepsy and idiopathic hypersomnia. It could be used by armed forces for sustained or continuous operations. The wakening effect is potent: modafinil allows healthy volunteers to stay awake and efficient for more than 60 hours, without side-effects. The mechanism of action of modafinil is complex, involving the adrenergic system (central 1-postsynaptic receptors), associated with serotonergic, GABAergic and probably dopaminergic systems. Moreover, the implication of excitatory amino acids was demonstrated. The anterior hypothalamic nucleus could be the main and specific target for modafinil. It could induce wakefulness by different mechanisms, as compared with other classical vigilance enhancing drugs such as amphetamines. A neuroprotective effect against neurotoxic organophosphate agents was recently discovered.

Author

Drugs; Pharmacology; Hypersomnia; Narcolepsy; Military Operations; Wakefulness

20010084179 NASA Ames Research Center, Moffett Field, CA USA

Body Mass Changes Associated With Hyper-Gravity are Independent of Adrenal Derived Hormones

Wade, Charles E., NASA Ames Research Center, USA; Moran, Megan M., NASA Ames Research Center, USA; Wang, Tommy J., NASA Ames Research Center, USA; Baer, Lisa A., NASA Ames Research Center, USA; Yuan, Fang, NASA Ames Research Center, USA; Fung, Cyra K., NASA Ames Research Center, USA; Stein, T. Peter, NASA Ames Research Center, USA; [2001]; 1p; In English; Experimental Biology, 31 Mar. - 4 Apr. 2001, Orlando, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Exposure to hyper-gravity results in a number of metabolic changes associated with increases in catecholamines and corticosterone. These changes result in a loss of body and fat mass. to assess the role of hormones derived from the adrenal gland in the changes we studied sham operated (SO) and adrenalectomized (ADX) male rats exposed to hyper-gravity of 2 G for 14 days. Control groups at 1 G were also studied. Urinary epinephrine (EPI) and corticosterone (CORT) were reduced in ADX animals. In response to 2 G there was an increase in urinary EPI and CORT in SO rats, while levels were unchanged in ADX animals. Both groups of animals had similar increases in urinary norepinephrine levels. The reductions of body mass gain in response to 2 G were the same in both groups. The decrease in relative fat mass was greater in ADX. Energy intake and expenditure were not different between groups. In response of returning to 1 G for 24 hours and reexposure to hyper-gravity there were no differences between SO and ADX in the changes of food and water intake, body mass or activity. The changes in metabolism with exposure to hyper-gravity do not appear to require hormones derived from the adrenal gland. The increase in lipolysis and alterations body and fat mass appear to be modulated by sympathetically derived norepinephrine.

Author

Hormones; Adrenal Gland; Gravitation; Catecholamine; Corticosteroids; Metabolism

20010084315 NASA Ames Research Center, Moffett Field, CA USA

The Exercise and Environmental Physiology of Extravehicular Activity

Cowell, S. A., NASA Ames Research Center, USA; Stocks, J. M., NASA Ames Research Center, USA; Evans, D. G., NASA Ames Research Center, USA; Simonson, S. R., NASA Ames Research Center, USA; Greenleaf, J. E., NASA Ames Research Center, USA; Aug. 10, 2000; 1p; In English

Contract(s)/Grant(s): RTOP 111-10-20; No Copyright; Avail: Issuing Activity; Abstract Only

Over the history of human expansion into space, extravehicular activity (EVA) has become indispensable for both daily living in weightlessness and for further space exploration. The physiological factors involved in the performance of extensive EVA, necessary for construction and maintenance of the International Space Station and during future human interplanetary missions, require further examination. An understanding of the physiological aspects of exercise and thermoregulation in the EVA environment will help to insure the health, safety, and efficiency of working astronauts. to that end, this review will focus on the interaction of the exercise and environmental aspects of EVA, as well as exercise during spaceflight and ground-based simulations such as bed-rest deconditioning. It will examine inflight exercise thermoregulation, and exercise, muscular strength, supine vs.

seated exercise, exercise thermoregulation, and exercise in a hypobaric environment. Due to the paucity of data from controlled human research in this area, it is clear that more scientific studies are needed to insure safe and efficient extravehicular activity.

Author

Extravehicular Activity; Exercise Physiology; Space Exploration; Weightlessness; Physical Exercise; Physiological Factors

20010085800 Bionetics Corp., Cocoa Beach, FL USA

Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001 *Final Report*

Roberson, Sheri, Editor, Bionetics Corp., USA; Kelly, Bruce, Editor, Bionetics Corp., USA; May 31, 2001; 120p; In English; 2001 NASA Occupational Health Conference, 25 Feb. - 2 Mar. 2001, Galveston Island, TX, USA; See also 20010085801 through 20010085818

Contract(s)/Grant(s): NAS10-12180; NAS10-001; RTOP 004-Y7-00

Report No.(s): NASA/CP-2001-210255; NAS 1.55:210255; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This Conference convened approximately 86 registered participants of invited guest speakers, NASA presenters, and a broad spectrum of the Occupational Health disciplines representing NASA Headquarters and all NASA Field Centers. Two days' Professional Development Courses on Exposure Assessment Strategies and Statistics and on Advanced Cardiac Life Support training and recertification preceded the Conference. With the theme, 'Risk Assessment and Management in 2001,' conferees were first provided updates from the Program Principal Center Office and the Headquarters Office. Plenary sessions elaborated on several topics: biological terrorism, OSHA recordability, Workers' Compensation issues, Federal ergonomic standards, bridging aerospace medicine and occupational health-especially in management of risk in spaceflight, and EAP operations with mission failures. A keynote address dealt with resiliency skills for 21st century workers and two NASA astronaut speakers highlighted a tour of the Johnson Space Center. During discipline specific breakout sessions, current issues in occupational health management and policy, credentialing and privileging, health risk assessment, measurement and standardization, audits, database development, prevention and rehabilitation, international travel and infection control, employee assistance, nursing process, and environmental health were presented.

Author

Aerospace Medicine; Conferences; Education; Health; Risk; Standardization

20010085802 NASA, Washington, DC USA

Healthy People 2010

Angotti, Catherine M., NASA, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 17-20; In English; See also 20010085800; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Major Healthy People (HP) 2000 goals closely tied to prevention were not met nationally: physical activity did not improve; evidence that it actually decreased; obesity did not decrease but instead increased in all groups, actually doubling in children; and incidence of type 2 diabetes did not decrease, but instead evidence showed that it increased in all age groups.

Derived from text

Obesity; Public Health; Physical Exercise; Prevention

20010085806 NASA Johnson Space Center, Houston, TX USA

The Role of Space Medicine in Management of Risk in Spaceflight

Clark, Jonathan B., NASA Johnson Space Center, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 37-45; In English; See also 20010085800; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The purpose of Space Medicine is to ensure mission success by providing quality and comprehensive health care throughout all mission phases to optimize crew health and performance and to prevent negative long-term health consequences. Space flight presents additional hazards and associated risks to crew health, performance, and safety. With an extended human presence in space it is expected that illness and injury will occur on orbit, which may present a significant threat to crew health and performance and to mission success. Maintaining crew health, safety and performance and preventing illness and injury are high priorities necessary for mission success and agency goals. Space flight health care should meet the standards of practice of evidence based clinical medicine. The function of Space Medicine is expected to meet the agency goals as stated in the 1998 NASA Strategic Plan and the priorities established by the Critical Path Roadmap Project. The Critical Path Roadmap Project is an integrated NASA cross-disciplinary strategy to assess, understand, mitigate, and manage the risks associated with long-term exposure to the space flight environment. The evidence based approach to space medicine should be standardized, objective process yielding expected

results and establishing clinical practice standards while balancing individual risk with mission (programmatic) risk. The ability to methodically apply available knowledge and expertise to individual and mission health issues will ensure appropriate priorities are assigned and resources are allocated. NASA Space Medicine risk management process is a combined clinical and engineering approach. Competition for weight, power, volume, cost, and crew time must be balanced in making decisions about the care of individual crew with competing agency resources.

Author

Aerospace Medicine; Health; Aerospace Safety; Risk

20010085811 Texas Univ., Director, Preventive, Occupational and Environmental Medicine, Galveston, TX USA

Bridging the Gap Between Aerospace and Occupational Medicine

Davis, Jeffrey R., Texas Univ., USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 61-72; In English; See also 20010085800; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Aerospace Medicine is one of the three specialty areas of Preventive Medicine (aerospace, occupational, and general preventive medicine/public health). Practitioners of aerospace or occupational medicine receive core training in preventive medicine and many receive an MPH degree. Specialists have practiced in both fields over the years due to the similarities in training and practice. Both aerospace and occupational medicine are concerned with maintaining the health of an individual at the worksite, and in the impacts of the work environment on health. Extreme work environments may be encountered in either specialty; aerospace medicine may be distinguished from occupational medicine somewhat by the nature of the extreme environments encountered such as acceleration, low ambient pressure, radiation, and fractional gravity. Both fields are concerned with health and productivity, safety, and enhancing performance. This presentation will explore the similar training and practice environments, as well as areas of needed expertise, for the aerospace and occupational medicine practitioner.

Author

Aerospace Medicine; Health; Analogies; Education

20010085813 NASA Kennedy Space Center, Cocoa Beach, FL USA

Physician's Breakout Session

Barry, William, NASA Kennedy Space Center, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 84-85; In English; See also 20010085800; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Dr. William Barry, Manager, NASA Occupational Health Program, moderated this session. As in one of the opening sessions, he re-iterated that the overall theme for the next year will be facilitating and implementing NIAT-1 (NASA Integrated Action Team - Action 1). He presented a candidate list of topics for consideration and discussion: (1) NIAT-1; (2) Skin cancer detection and the NASA Solar Safe Program; (3) Weapons of mass destruction; (4) Quality assurance; (5) Audits; (6) Environment of care; (7) Infection control; (8) Medication management; and (9) Confidentiality of medical records.

Author

Health; Quality Control; Systems Management

20010085814 NASA Kennedy Space Center, Cocoa Beach, FL USA

Nurse's Breakout Session NASA Occupational Health Database

Shoemaker, Helen, NASA Kennedy Space Center, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 86-98; In English; See also 20010085800; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

An overview of the NASA Occupational Health Program database project was presented. The presentation stimulated many questions and discussion surrounding the data elements.

Author

Data Bases; Health

20010085815 NASA Johnson Space Center, Houston, TX USA

Nurse's Breakout Session Injury/Illness Case Management

Hesseltger, Connie, NASA Johnson Space Center, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 99-101; In English; See also 20010085800; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

An overview of the work related injury and illness case management model developed at the Johnson Space Center was presented. The major accomplishments and the challenges of implementation were discussed.

Author

Injuries; Sickneses; Management Systems

20010085817 Silverstein (Bernard), Inc., USA

Professional Development Course 1 Exposure Assessment Strategies and Statistics

Silverstein, Bernard, Silverstein (Bernard), Inc., USA; Arnold, Susan, Silverstein (Bernard), Inc., USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 104; In English; See also 20010085800; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The course provided attendees with the knowledge and skills necessary to develop strategies for effectively managing workplace exposures. The strategies lead to more efficient use of monitoring resources, better evaluation of exposures and monitoring data, and improved communication of exposure risks to employees and management. The comprehensive two-day workshop described strategies for the collection and interpretation of occupational exposure monitoring and data. The course was based on American Industrial Hygiene Association's publication 'A Strategy for Assessing and Managing Occupational Exposures, 2nd edition, 1998'. Key concepts from this recent publication covered in the course included exposure groups, sampling designs, statistical distributions, and interpreting exposure-monitoring data. Experience and lessons learned in the field were shared by attendees. Problem solving exercises were interwoven throughout the course and attendees worked through examples that helped them apply the concepts. Statistical tools to assist with decision-making regarding the acceptability of exposure monitoring results were also presented. The course received two American Board of Industrial Hygiene certification maintenance points and 16 hours of continuing medical education credit from the University of South Florida. Additional information is contained in the original extended abstract.

Author

Exposure; Industrial Safety; Monitors; Work

20010085818 Texas Univ., Medical Branch, USA

Professional Development Course 2: Advanced Cardiac Life Support (ACLS) Recertification Course

Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 105; In English; See also 20010085800; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The course implemented the American Heart Association (AHA) ACLS guidelines established in October 1992. The premise behind the new guidelines is to provide a more flexible and patient-focused approach for treating various cardiac dysrhythmias. Teaching in this course focused on lecture, practical skills, group interaction and case-based learning sessions. Each session provided Clinical Case presentations focusing on critical points related to specific algorithm. During Clinical Case presentations, the participants were expected to actively participate and perform/practice skills unprompted. The AHA's current Textbook of Advanced Cardiac Life Support was the recommended reference for this course. The text provided the skills, physiological, and pathophysiological knowledge base necessary for successful completion of this course. Advanced Cardiac Life Support skills were evaluated during the ACLS Clinical Cases. A total of seven hours of Category 1 credit toward the American Medical Associations (AMA) Physician's Recognition Award, and/or seven hours in Category 2 for non-physicians were awarded for this course. The University of Texas Medical Branch is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education for physicians.

Author

Education; Physicians; Cardiology

20010085949 Netherlands Aeromedical Inst., Soesterberg, Netherlands

Feedback During Centrifuge Training: The Use of Ear Pulse Waveform Parameters as Feedback *Final Report*

Holewijn, M., Netherlands Aeromedical Inst., Netherlands; IJspeert, J., Netherlands Aeromedical Inst., Netherlands; Los, M., Netherlands Aeromedical Inst., Netherlands; February 2001; 32p; In English; Original contains color illustrations

Contract(s)/Grant(s): TNO Proj. 021.97.2202

Report No.(s): TD-2001-0126; Rept-2001-K1; Copyright; Avail: Issuing Activity

A centrifuge experiment was performed to evaluate the use of physiological measures as feedback parameters during centrifuge training. The main goal of this experimental study was to evaluate the use of the ear pulse arterial waveform as a potential feedback parameter of a pilot's anti-G straining maneuver during centrifuge training. A realtime feedback system was developed for use in the gondola of the human centrifuge at the Netherlands Aeromedical Institute. The feedback signal was

derived from an online analysis of the ear pulse waveform of the pilot. The amplitude of the ear pulse waveform was displayed by means of a 10 cm LED bar, placed in front of the trainee. These measurements were carried with six pilots, undergoing three regular training profiles in a human centrifuge. The results of this first validation experiment indicate that the feedback signal is possibly beneficial to the trainee in the centrifuge. However, modifications should be made to the software analysis module in order to track also the baseline shifts of the ear pulse waveform.

Derived from text

Human Centrifuges; Physiological Responses; Biofeedback; Pulse Amplitude; Antigravity; Ear

20010086579 Civil Aerospace Medical Inst., Oklahoma City, OK USA

Assessment of Head-Injured Aircrew: Comparison of FAA and USAF Procedures Final Report

Fiedler, Edna, Civil Aerospace Medical Inst., USA; Orme, Daniel R., Civil Aerospace Medical Inst., USA; Mills, William, Civil Aerospace Medical Inst., USA; Patterson, John C., School of Aerospace Medicine, USA; July 2001; 12p; In English

Contract(s)/Grant(s): AM-B-01-HRR-517

Report No.(s): DOT/FAA/AM-01/11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Federal Aviation Administration and the USA Air Force are similarly charged with determining whether aviators who have sustained head injuries are medically qualified to return to flying. The purpose of this paper is to first explain the major differences in missions between the USAF and the FAA, and then outline these procedures and rules, note their similarities and differences, address the strengths and weaknesses of each approach, and discuss the possible reconciliation of these differences. Finally, brief case material are presented to illustrate both evaluation methods.

Author

Aircraft Pilots; Head (Anatomy); Injuries

20010088360 Institute of Space Medico-Engineering, Beijing, China

Human Dynamic Response to Landing Impact in Selected Body Orientations

Liu, Bing-Kun, Institute of Space Medico-Engineering, China; Wang, Xian-Min, Institute of Space Medico-Engineering, China; Wang, Yu-Lan, Institute of Space Medico-Engineering, China; Jiang, Shi-Zhong, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0827; Volume 14, No. 2, pp. 121-123; In Chinese; Copyright; Avail: Issuing Activity

Objective: to study changes of human dynamic response to landing impact in selected body orientations. Method: Five healthy young men were exposed to 10 G, 50 ms half-sine acceleration pulses. The angle included between human head-iliac axis and impact force direction was 30deg to approx. 70deg. The acceleration responses at head, shoulder, chest and iliac of the subjects were recorded along head-iliac and chest-back directions. Result: Within limits of the experiments, the minimum peak response at the head along head-iliac direction was 10.36 +/- 2.44 G at 50deg, and the maximum was 18.07 +/- 3.29 G at 70deg. The minimum peak response at the chest along head-iliac direction was 10.39 +/- 3.97 G at 70deg, and the maximum was 15.42 +/- 3.61 G at 60deg. The minimum peak response at the head along chest-back direction was 7.58 +/- 1.18 G at 30deg, and the maximum was 18.89 +/- 1.85 G at 70deg. The minimum peak response at the chest along chest-back direction was 7.21 +/- 1.99 G at 30deg, and the maximum was 17.67 +/- 2.16 G at 70deg. Conclusion: It was inferred that the best body orientation angle for landing impact might be 50deg.

Author

Dynamic Response; Landing Loads; Human Reactions; Aerospace Medicine; Impact Loads

20010088363 Georgetown Univ., Medical Center, Washington, DC USA

Dysregulation of the Stress Response in the Persian Gulf Syndrome Final Report, 6 May 1996 - 5 Oct. 1999

Clauw, Daniel; Nov. 1999; 53p; In English

Contract(s)/Grant(s): DAMD17-96-1-6042

Report No.(s): AD-A390441; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Approximately 20% of Gulf War veterans who have presented to DoD and VA health registries have unexplained symptom-based illnesses that have been termed the Persian Gulf Syndrome or Gulf War Illnesses (GWI). Similar syndromes (fibromyalgia (FMS), chronic fatigue syndrome (CFS), etc.) are also known to occur at a high rate in the general population. Collectively, we refer to these syndromes as chronic multisymptom illnesses (CMI). CMI are typically initiated and perpetuated by a variety of physical and emotional stressors. Studies of CMI have shown that there are a number of objective neurohumoral abnormalities in the human "stress response" which may be responsible for the symptoms seen in these entities. This study was designed to demonstrate that individuals with GWI: 1) display centrally mediated disturbances in autonomic tone, leading to smooth muscle dysmotility, and symptoms such as irritable bowel syndrome, 2) display diffuse disturbances in nociception (pain

threshold) that are partly responsible for many of the pain-related symptoms seen in GWI, and 3) display the same blunting of the hypothalamic-pituitary axes seen in some CMI, and contributes to the observed fatigue. We have extensively studied these three different stress responses in a total of 125 subjects in this project (25 GWI, 49 healthy normal controls, and 51 with CMI). Currently our data demonstrate that this cohort of GWI subjects shows evidence of peripheral nociceptive abnormalities, as well as smooth muscle dysmotility (similar process that may underly CMI).

DTIC

Responses; Health; Signs and Symptoms; Stress (Physiology)

20010088364 Sichuan Univ., Center for Biomedical Engineering, Chengdu, China

Segmentation of Medical Ultrasound Image Using Hybrid Neural Network

Wang, Tian-Fu, Sichuan Univ., China; Zheng, Chang-Qiong, Sichuan Univ., China; Zheng, Yi, Minnesota State Univ., USA; Li, De-Yu, Sichuan Univ., China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 84-87; In English

Contract(s)/Grant(s): NSFC-69631020; NSFC-69972029; Copyright; Avail: Issuing Activity

Objective: to solve one of the most difficult problems in multi-dimensional reconstruction of medical ultrasonic images: image segmentation. Method: A new segmental method based on hybrid neural network was presented in this paper. The hybrid neural network comprised two phases. The first phase was Kohonens self-organization neural network, which was used to segment and label the image coarsely. The feature vectors of those pixels within a specified distance from the cluster centers were employed to train the second phase, a three-layer perception network using back-propagation(BP) technique. Then the trained BP network was used to label every pixel of the image. In the end, a post-processing stage was used to remove the small isolated points and smooth out the contour's of the segmented image. Result: The segmented image had smooth continuous edges, few noises or speckles, and the contour of ventricle was clear and accurate. Conclusion: Our method could segment the ultrasonic images accurately and effectively, and had a lot of advantages compared to traditional methods. The unsupervised segmentation problems could be solved using supervised methods.

Author

Ultrasonics; Imaging Techniques; Neural Nets

20010088366 Fourth Military Medical Univ., Dept. of Aerospace Biodynamics, Xi'an, China

Changes of Cerebral Blood Flow During 21 d Head-down Tilt Bed Rest and the Effect of Lower Body Negative Pressure During the Last Week

Sun, Xi-Qing, Fourth Military Medical Univ., China; Yao, Yong-Jie, Fourth Military Medical Univ., China; Wu, Xing-Yu, Fourth Military Medical Univ., China; Hao, Wei-Ya, Fourth Military Medical Univ., China; Jiang, Shi-Zhong, Fourth Military Medical Univ., China; Qiao, Zong-Lin, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 92-96; In Chinese; Copyright; Avail: Issuing Activity

Objective: to investigate the changes of cerebral blood flow (CBF) during 21 d head-down tilt (HDT) bed rest and the effect of lower body negative pressure (LBNP) in the last week. Method: Twelve healthy male subjects were randomly divided into control and LBNP groups, with 6 in each group. All of them were exposed to -6degHDT for 21 d. The LBNP group received -4.0 kPa LBNP training 1 h/d in the last week of HDT while the control group did not. CBF and cerebral vascular resistance were measured by rheoencephalogram in pre-HDT, day 3, 10 and 21 of HDT. Result: In control group, left cerebral 1 quadrant area and inrush velocity decreased significantly during HDT, and left cerebral (Delta)Gy wave crest height decreased significantly, whereas left cerebral resistance index increased significantly on day 3 and 21 of HDT as compared to those of pre-HDT. In LBNP group, left cerebral 1 quadrant area decreased significantly, and left cerebral (Delta)Gy wave crest height and inrush velocity tended to decrease on day 3 and 21 of HDT, whereas left cerebral resistance index increased significantly during HDT as compared to those of pre-HDT. There were no significant differences between above indexes in control group and LBNP group. Conclusion: It is suggested that 21 d HDT may increase cerebral vascular resistance and decrease CBF, which can not be prevented by LBNP training in the last week of 21 d HDT.

Author

Brain Circulation; Physiological Responses; Bed Rest; Blood Flow; Cerebrum

20010088369 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

Modeling of Feeling Institution in Pilot Structural Model

Qu, Xiang-Ju, Beijing Univ. of Aeronautics and Astronautics, China; Wei, Hong, Beijing Univ. of Aeronautics and Astronautics, China; Guan, Jian-Cheng, Beijing Univ. of Aeronautics and Astronautics, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 124-127; In Chinese; Copyright; Avail: Issuing Activity

Objective: to improve a structural pilot model proposed by R. A. Hess, in which element of observation feeling institution was neglected. Method: Real simulation results showed that there was a blind region for small observation signal, and pilot made no response in this region. So we knew that the basic characteristics of the observation feeling institution were observation threshold and observation noise. A Neural Network (NN) receptor model was augmented in the structural pilot model to describe the characteristics of human observation feeling institution. Further more, using the augmented model, the affection of the pilot model on the characteristics of the closed-loop system of pilot and controlled element was studied. Result: The affection of NN perceptron on the closed-loop system was that the stable gain region of the human pilot was extended. Conclusion: The proposed model was reasonable for the element of human feeling institution.

Author

Feedback Control; Sensory Feedback; Random Noise; Neural Nets; Models

20010088847 Institute of Space Medico-Engineering, Beijing, China

Changes of Brain Potentials Related to Auditory Location Discrimination during Simulated Weightlessness

Zhao, Lun, Institute of Space Medico-Engineering, China; Wei, Jin-He, Institute of Space Medico-Engineering, China; Ren, Wei, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 97-101; In Chinese; Copyright; Avail: Issuing Activity

Objective: to study changes of brain response in distinguishing auditory location during simulated weightlessness. Method: The event-related potentials (ERPs) during auditory location discrimination were compared between head down tilt (HDT) and head up tilt (HUT) conditions among 14 healthy subjects. Result: (1) Both the target (T) and non-target (NT) auditory signals induced significant ERPs; (2) The slow potential was significantly lower for both T and NT-ERPs during HDT as compared with that during HUT; (3) The reduction of mean slow potential amplitude during HDT was more significant for the target signals from right-rear position and lightest for the target signals from right-front position. This phenomenon was more remarkable at left-front area. Conclusion: These data provide further evidence that the higher brain function was affected by simulated weightlessness.

Author

Brain; Weightlessness Simulation; Head Down Tilt; Attitude (Inclination); Auditory Signals

20010088880 Institute of Aviation Medicine, Beijing, China

Ground Simulation of the G-excess Illusion

Jia, Hong-Bo, Institute of Aviation Medicine, China; Yu, Li-Shen, Institute of Aviation Medicine, China; Bi, Hong-Zhe, Institute of Aviation Medicine, China; Wang, Kui-Nian, Institute of Aviation Medicine, China; Liu, Zheng, Institute of Aviation Medicine, China; Xie, Su-Jiang, Institute of Aviation Medicine, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 88-91; In English; Copyright; Avail: Issuing Activity

Objective: to observe the subjects perception of orientation following certain head movements or change of simulator cab attitude in hypergravity (HG), and assess the feasibility of simulating G-excess illusion on the ground by a centrifuge-like Spatial Disorientation (SD) simulator. Method: 1.6 G force field was generated by planetary rotation of the simulator. Perception of orientation of the cab were collected from twelve male pilots' report following their heads pitch movements in pitch plane or cab attitude changes in roll plane under 1.6 G. Result: While making a pitch-up head movement, the pilots experienced a 63.8deg +/- 48.3deg pitch-up attitude change of the cab in pitch plane, and when the cab was tilted left 20deg, pilots experienced a tilt-left perception of 48.6deg +/- 39.4deg in roll plane. Conclusion: Although there's strong Coriolis effects onboard the SD simulator under 1.6 G, most pilots experienced the G-excess illusion. It demonstrated that it was feasible to use the centrifuge-like device to generate this kind of illusion on the ground.

Author

High Gravity Environments; Acceleration (Physics); Field Theory (Physics); Simulation; Planetary Rotation

20010089074 Institute of Space Medico-Engineering, Beijing, China

Changes of Dynamic ECG before, during, and after Parabolic Flight

Sun, Hua-Di, Institute of Space Medico-Engineering, China; Gai, Yu-Qing, Institute of Space Medico-Engineering, China; Xie, Jun-Shui, Institute of Space Medico-Engineering, China; Yu, Yao-Rong, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 140-143; In Chinese; Copyright; Avail: Issuing Activity

Objective: to study the characteristics of pilots' electrocardiogram during parabolic flight. Method: Dynamic electrocardiogram (DCG, CM, and CM, bipolar leads) were recorded in 13 pilots before, during and after parabolic flights. Result: Preflight and postflight values of heart rate(HR) and cardiac rhythm were essentially the same in all cases, but HR increased to a higher level of 86.0 +/- 7.3 bpm with maximum of 137.0 +/- 12.2 bpm, and minimum of 57.7 +/- 6.6 bpm during parabolic flights.

During flights, one pilot's cardiac rhythm changed slightly and in another pilot T wave became inverted. In other two pilots, ST segments shifted downward more than 0.1 mV transiently. All these pilots showed negative result in maximal exercise on the ground. Conclusion: DCG could be used to evaluate the changes of cardiac electric activity during the whole parabolic flight.

Author

Weightlessness Simulation; Electrocardiography; Parabolic Flight; Heart Rate

20010089075 Institute of Space Medico-Engineering, Beijing, China

Isokinetic Concentric Dynamometry of Knee Flexors and Extensors in Young Male

Ni, Cheng-Zhi, Institute of Space Medico-Engineering, China; Xie, Bao-Sheng, Institute of Space Medico-Engineering, China; Zhang, Wen-Zheng, Institute of Space Medico-Engineering, China; Liu, Yu-Sheng, Institute of Space Medico-Engineering, China; Sun, Hong-Yi, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 111-115; In Chinese; Copyright; Avail: Issuing Activity

Objective: to investigate the effects of different moving speeds on isokinetic dynamometry of knee flexors and extensors, and to provide non-native data for comparative purposes in strength evaluations. Method: Thirty healthy male were tested at 60, 180, and 240 deg/sec angular velocities using a REV9000 testing and rehabilitation system. Result: Both PT(peak torque) and PT/BW(peak torque/body weights) showed significant differences(P is less than 0.01, P is less than 0.05) between flexors and extensors and declined significantly with increased speed (P is less than 0.001). Peak torque differences between dominant and non-dominant knee (Di%) was 10%. TPT (time to peak torque) tended to decrease as moving speeds increased(P is less than 0.001). APT(angle of peak torque) were 50% to approx. 70% for quadriceps, and 32% to approx. 45% for hamstrings; H/Q (hamstrings peak torque/quadriceps peak torque) was 50% to approx. 60%; WF(work fatigue) was 65%. Conclusion: The results provided a reference for strength evaluations in space medicine and space physiology, especially under simulated weightlessness and microgravity.

Author

Flexors; Weightlessness Simulation; Aerospace Medicine; Muscular Strength

20010089076 Institute of Space Medico-Engineering, Beijing, China

Application of Brain State Related EEG Complexity Measure in Mental Workload Evaluation

Han, Dong-Xu, Institute of Space Medico-Engineering, China; Zhou, Chuan-Dai, Institute of Space Medico-Engineering, China; Liu, Yue-Hong, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 102-106; In Chinese; Copyright; Avail: Issuing Activity

Objective: The Application of C(sub s) to mental workload evaluation was investigated. Method: EEG of 47 male (aged 23 to approx. 33) were recorded during rest or doing mental arithmetic, and changes of C(sub s) with relation to mental arithmetic load were analyzed and compared by means of C(sub s) analysis method. Result: C(sub s) distribution was laterally symmetry, higher in temporal and lower in occiput. The changes of C(sub s) over some brain areas were outstanding and stable while doing mental arithmetic: type A, 38 subjects(81 %), C(sub s) under mental arithmetic were significantly higher than C(sub s) under rest except over prefrontal, and the most outstanding areas were post-temporal and left parieto-occipital regions; type B, 9 subjects(19%), C(sub s) over post-temporal and parieto-occipital under rest is higher than type A, and C(sub s) under mental arithmetic descend significantly (the most outstanding areas were right central and mid-temporal, then left frontal-central and pre-temporal). Moreover there were some possible relationship among C(sub s), mental arithmetic score and subjective evaluation of mental workload. Conclusion: There exists high correlation between C(sub s) and mental arithmetic activity, and C(sub s) could well reflect brain function state. It provide a new method and a possible way for objective evaluation of mental workload and studies of brain cognitive activities.

Author

Brain; Mental Performance; Workloads (Psychophysiology); Electroencephalography; Loads (Forces)

20010089077 Institute of Aviation Medicine, Beijing, China

Protective Effects of Tea Polyphenols on Mild Hypobaric Hypoxia Induced Pulmonary Free Radical Metabolic Disorder in Mice

Zhan, Hao, Institute of Aviation Medicine, China; Lu, Jiang-Yang, People's Liberation Army, China; Zhang, Qing-Jun, Institute of Aviation Medicine, China; Tong, Li, Institute of Aviation Medicine, China; Xin, Yi-Mei, Institute of Aviation Medicine, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 79-83; In English

Contract(s)/Grant(s): PLA-96Q029; Copyright; Avail: Issuing Activity

Objective: to observe the protective effects of natural antioxidant tea polyphenols(TP) on repeated mild hypobaric hypoxia induced pulmonary free radical metabolic disorder in mice. Method: Forty-two male Kunming mice were randomly divided into

three groups(n = 14 each):normal control(A);1500 in mild hypobaric hypoxia(B) and TP protection group(C). The exposure time in hypobaric chamber was 2 h/d,3 d/wk, 8 wk in total. Before hypoxic exposure,TP was orally given to group C at a dose of 100 mg/kg,while distilled water was given to the other two groups. After experiment, the mice were decapitated on the next day and the lung was quickly removed. The malondialdehyde (MDA) concentration, superoxide dismutase (SOD) activity and nitric oxide(NO) content were measured. In addition, Cu, Zn-SOD and inducible NO synthase (iNOS) enzymatic contents in lung were qualitatively examined by immunohistochemical assaying. Result: Compared with the control group, pulmonary MDA concentration and NO content were significantly increased after chronic mild hypobaric hypoxic exposures (P is less than 0.01), but the MDA formation and NO generation in TP protection group were restored to normal. Pulmonary SOD activity in group B tended to increase. Cu,Zn-SOD expression in endothelial cells of bronchioli and iNOS contents in endothelial cells of bronchioli and endothelial cells and smooth muscle cells in pulmonary interstitial vessels were significantly elevated after repeated mild hypobaric hypoxic exposure. These enzymatic abnormal expressions regained to normal after administration of TP. Conclusion: Natural antioxidant TP had protective effects on repeated mild hypobaric hypoxia induced pulmonary free radical metabolic disorder.

Author

Hypobaric Atmospheres; Enzyme Activity; Abnormalities; Phenols; Inorganic Peroxides

20010089135 Army Research Inst. of Environmental Medicine, Natick, MA USA

Effect of Energy Deficit on Physical Performance at Sea Level and 4300 m Altitude

Fulco, Charles S., Army Research Inst. of Environmental Medicine, USA; Friedlander, Anne, Army Research Inst. of Environmental Medicine, USA; Muza, Stephen R., Army Research Inst. of Environmental Medicine, USA; Rock, Paul B., Army Research Inst. of Environmental Medicine, USA; Robinson, Scott, Army Research Inst. of Environmental Medicine, USA; Lammi, Eric, Army Research Inst. of Environmental Medicine, USA; Baker-Fulco, Carol J., Army Research Inst. of Environmental Medicine, USA; MacDonald, Jay, Army Research Inst. of Environmental Medicine, USA; Kambis, Kenneth, Army Research Inst. of Environmental Medicine, USA; Braun, Barry, Army Research Inst. of Environmental Medicine, USA; May 30, 2001; 28p; In English

Report No.(s): AD-A390592; USARIEM-TR-T01-10; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We investigated the effect on physical performance of three weeks of severe deficit energy intake at sea level (SL) and high altitude (HA, 4300 m). Twenty-six young healthy men (range 18 to 36 yrs) were assigned for three weeks to one of three dietary and environmental groups. One group consumed adequate kcal/day to maintain body weight while living at HA (ADQ, n=7) and two groups consumed 1500 kcal/day to maintain body weight while staying at SL (HYPO, n=9) or HA (DEF, n=10). For all groups, physical performance was assessed at SL prior to dietary phase assignment (i.e., baseline), and on days 2, 10 and 20 of the dietary phases. The physical performance tasks were: (1) maximal oxygen intake (VO₂max); (2) time to complete 50 lift and carry cycles; (3) number of one-arm elbow flexions (10% body weight at 22 flexions/min); and (4) adductor pollicis muscle exercise (repeated 5 sec static contractions at 50% of maximal force /5sec rest). After 3 weeks, relative to the baseline phase, the HYPO and DEF groups lost nearly 5% and 8% body weight, respectively, and 3% and 6% lean body mass, respectively. The body weight and lean body mass losses of the HYPO and DEF groups were significantly greater than those of the ADQ group (Pis less than 0.01), who lost neither body weight nor lean body mass (P>0.05). VO₂max was not impaired during body weight loss for the HYPO group (P>0.05) whereas VO₂@max declined by 30% on day 2 of HA exposure compared to the SL baseline phase for the ADQ and DEF groups. However, VO₂max for either the ADQ or DEF group did not change with continued HA exposure (P>0.05). Time to complete the lift and carry task was impaired for the ADQ and DEF groups on day 2 of HA exposure (Pis less than 0.05), but subsequently improved (Pis less than 0.05) for both groups similarly with continued HA exposure. One-arm elbow flexion and adductor pollicis muscle performance tasks did not differ among groups either before or during the dietary phases (P>0.05). We conclude that significant lean body mass losses due to three weeks of underfeeding do not impair maximal or submaximal physical performance either at SL or during the first 3 weeks of exposure to HA.

Author

Physical Exercise; Body Weight; Muscular Function; Energy Levels; Diets

20010089313 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Perfluoroisobutene (PFIB)-Induced Pulmonary Edema and Lung Surfactant Damage: Treatment with Curosurf and N-Acetylcysteine (NAC) Final Report

vandeMeent-vanderHorst, D., Prins Maurits Lab. TNO, Netherlands; Oostdijk, J. P., Prins Maurits Lab. TNO, Netherlands; Joosen, M. J. A., Prins Maurits Lab. TNO, Netherlands; vanEsch, J. H. M., Prins Maurits Lab. TNO, Netherlands; Diemel, R. V., Prins Maurits Lab. TNO, Netherlands; Hammer, A. H., Prins Maurits Lab. TNO, Netherlands; vanHelden, H. P. M., Prins Maurits Lab. TNO, Netherlands; May 2001; 35p; In English; Original contains color illustrations

Contract(s)/Grant(s): A99/M4/BE; TNO Proj. 014.12473

Report No.(s): TD2001-0022; PML-2001-A22; Copyright; Avail: Issuing Activity

Airborne exposure to many lung-toxic agents results in damage to the lung surfactant system which may lead to a life-threatening pulmonary edema and respiratory distress which are refractory to treatment. The aim of the present study was to investigate the respiratory injury caused by inhalation of perfluoroisobutene (PFIB), a pyrolysis product of for example, Teflon, as well as a potential chemical warfare agent, and the therapeutic efficacy of a treatment consisting of the natural surfactant Curosurf and/or the anti-inflammatory drug N-acetylcysteine (NAC). For that purpose rats were nose-only exposed to 1 LCt(sub 50) (t = 20 min) of PFIB. Lung physiological parameters (respiratory frequency, RF, lung compliance, Cdyn, and airway resistance, Raw), lung wet weight (LWW), airway pathology, and in BAL(BronchoAveolar Lavage) fluid: total protein, leucocyte influx and changes in surfactant surface tension were examined. Curosurf treatment decreased pulmonary edema caused by PFIB which was reflected by a decreased lung wet weight (LWW) and was confirmed by histological examination. Curosurf also decreased the amount of protein present in BAL fluid. In contrast to Curosurf, NAC prevented or discontinued the interstitial pneumonia which was reflected by a decreased influx of neutrophils into the lungs. The surface tension of BAL fluid was lower after Curosurf treatment compared to that in untreated PFIB-exposed animals. The combined treatment of Curosurf and NAC improved respiration (RF and Cdyn). It was concluded that Curosurf predominantly decreased pulmonary edema and NAC predominantly reduced the lung inflammation. The combined treatment (Curosurf + NAC) was more effective than each of them alone and may therefore be considered a promising therapeutic measure in early-stage acute respiratory distress caused by inhaled PFIB.

Author

Pulmonary Functions; Edema; Lungs; Respiratory Physiology; Toxicity; Drugs; Treatment; Surfactants; Lung Morphology

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20010085808 NASA Johnson Space Center, Houston, TX USA

Emotional/Mental Challenges Pre-, In-, and Post-Flight

Voss, Janice, NASA Johnson Space Center, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 47; In English; See also 20010085800; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Dr. Voss has flown aboard the Space Shuttle five times. She knows well her inner concerns, emotions, and mental challenges attending such highly demanding and risky adventures. and she has shared those ideas with her colleagues. She notes that their busy training schedules and fully committed on orbit time allow little time for dwelling on most of these issues. However, they are nonetheless real and may not be ignored with impunity. She thinks that perhaps they are more striking for rookie space farers, but all spacecrew members share them and can profit by assuring proper support and unique solutions for their own specific situation, which could vary with the mission. In her own experience, she found notable benefit from sharing with close members of her family, both before flight and during. The latter has proved of great value to all crew persons in the form of their personal ground contact time with family and friends. In addition, how one arranges and what one provides in the on board personal space and time goes far toward keeping a confident and upbeat view of the big picture. The type and amount of off duty diversions (e.g., music, reading material) are important, as are how one participates in group time. and it is universally agreed that viewing time at the spacecraft windows offers great joy and calm. Dr. Voss conjectures that there could be a difference in how people deal with these matters on busy, short-duration (Shuttle type) missions versus those of longer ones, particularly out of low earth orbit, where the options in the advent of mishap are fewer. Her final opinion is one of optimism and assurance that the human person will do well in coping with this new environment.

Author

Emotional Factors; Space Shuttle Missions; Psychological Effects

20010085812 National Speaker's Association, USA

Resiliency Skills for the 21st Century: How to Add Life to Your Years and Years to Your Life

Singer, Jack N., National Speaker's Association, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 73-82; In English; See also 20010085800; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Stress involved in 8 of 10 top causes of death and \$270 billion per year in lost productivity, medical bills, and insurance claims. The impact of stress, anxiety, and depression in the workplace includes 47% reduced productivity, 40% absenteeism, 40% morale problems, 21% turnover, and 50% of workers would not choose same career. Thirty-five percent to 50% of physician visits are 'worried well'. At least 65% of physician visits are for stress-related symptoms. Resiliency is the capacity to spring back, rebound, and successfully adapt on the face of adversity.

Author

Signs and Symptoms; Stress (Psychology); Psychological Effects

20010085950 Institute for Human Factors TNO, Soesterberg, Netherlands

The Road to Readiness: Development of a Framework for Education and Training in the Royal Netherlands Navy *Interim Report Op Weg Naar Ge oefendheid: Ontwikkeling van een Raamwerk*

Schaafstal, A. M., Institute for Human Factors TNO, Netherlands; Riemersma, J. B. J., Institute for Human Factors TNO, Netherlands; Jul. 09, 2001; 23p; In English

Contract(s)/Grant(s): 013.20366; TNO Proj. 790.2

Report No.(s): TD2001-0152; TM-01-A045; Copyright; Avail: Issuing Activity

There is a growing emphasis on training for readiness. Such training should preferably focus on the acquisition of knowledge, skills and attitudes that are applicable in a wide range of contexts and not so much emphasize training for specific operations. Given the wide range of possible operations and missions, the sheer number of specific operations makes the latter approach untenable. For training to be effective, the focus should furthermore not be on outcomes (e.g. making the right decision), but more on the underlying processes (e.g. making the decision right). The question thus is to develop a framework for attaining readiness through integrated shipboard training and exercising. In a survey of approaches to training in the US Navy, we identified the Event-based Approach to Training as a good starting point for a framework for training towards readiness. We further identified several training strategies that have already been applied successfully in the domain of readiness. A weak point for implementation of any approach and strategy is the lack of support tools, both in the development of exercises, as during the execution and evaluation of exercises. That is why we also reviewed already existing tools, also with regard to the question whether they can be made applicable in a short-term. This is followed by a review of currently existing methods for training development and the acquisition of training media. By piecing all these elements together, we outlined a framework for development and implementation of integrated shipboard training and exercising. The "Event-Based Approach to Training" is chosen as a good approach for attaining readiness. From a number of applicable training strategies, we singled out Team Dimensional Training as a good strategy for training shipboard teams to self-correct both in terms of team processes as well as team outcomes. As a useful approach for performance measurement we identified the Command & Control Performance Measurement Tool (C2PMT) as a good start, especially when it can be implemented in a hand-held device (MATE). A framework for readiness training, partly based on developments and experiences within the US Navy, is now available. It includes several existing methods and techniques, which, after tailoring to the situation within the RNLN, can be made available within a relatively short time frame.

Author

Military Technology; Military Operations; Navy; Netherlands; Training Analysis

20010085955 Institute for Human Factors TNO, Soesterberg, Netherlands

Results Inventory Royal Netherlands Army and MultiMedia in Preparation of Development Projects 2001 *Final Report Resultaten Inventarisatie Koninklijke Landmacht en Multimedia ter Voor-Bereiding op Ontwikkelprojecten 2001*

Veldhuis, G. J., Institute for Human Factors TNO, Netherlands; Boot, E. W., Institute for Human Factors TNO, Netherlands; May 31, 2001; 84p; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): 013.10304; TNO Proj. 790.1

Report No.(s): TD2001-0141; TM-01-A035; Copyright; Avail: Issuing Activity

In this study we explored how computer-based training programs can be optimally implemented within the Royal Netherlands Army. The aim of this study was to describe an integrated architecture, by which multimedia material can be developed. In the future, the Staff Training Command Royal Netherlands Army wants to implement multimedia material in the training and education of the Royal Netherlands Army (RNLA) on a large scale. Therefore, we developed a model to describe various forms of multimedia that can be embedded in the RNLA. Subsequently, an inventory was made within various training centres of the RNLA. The results served as a fundament for establishing a number of pilot projects that can be carried out in 2001. In addition, an inventory was made of multimedia material available on the civil market that could be imbedded in RNLA training courses. Six schemes for analysis were developed in order to determine if a particular development situation would meet the requirements to develop and implement a multimedia product successfully. Also, a template was created for large-scaled development of multimedia material. With the use of this template, instructors were able to develop CBT material in a fast and efficient manner.

In addition, future development projects will be related to international standards. Therefore, the Intelligent System Laboratory Amsterdam compared different standardisation developments. Despite many years of CBT development within the RNLA, not many multimedia applications are developed yet. The prerequisites strongly differ among the various locations visited. To relieve the instructors from a number of standard tasks, the aim is to develop and implement more computer-based training materials. A high amount of overlap was found with respect to qualifications that have to be learned both within and outside the RNLA training courses. This overview allows the RNLA to purchase materials from civil training courses. Considering standardisation, no ready to hand solutions appear to be available yet concerning multimedia developments. In order to (re)use newly developed multimedia material in the near future, standards nevertheless have to be followed as much as possible. The first version of the CBT generator allows developers to create educational materials in an efficient way. Investments in CBT development need to be extended in order to enhance the capacity of the required infrastructure and multimedia development for the near future. Based upon the inventory of qualifications that will to be finished in 2001, a focus can be put on areas in which CBT material can be acquired and in which co-operation with civil partners is possible. The inventory regarding the current and future multimedia use presents a clear view on development pilot projects that can be established the next couple of years within the RNLA. Especially projects in which the CEIT generator and E-Learning (learning by the Internet) can be implemented are strategically important. In this respect, the six schemes for analysis can be used as starting points. Results of this study will be used for future multimedia developments.

Author

Computer Techniques; Computer Assisted Instruction; Netherlands; Learning Theory; Armed Forces (Foreign); Multimedia

20010086578 Institute for Human Factors TNO, Soesterberg, Netherlands

Critical Thinking in Tactical Command: A Training Study Interim Report Kritisch Denken in Tactische Commandovoe-ring: Een Trainingstudie

vandenBosch, K., Institute for Human Factors TNO, Netherlands; Helsdingen, A. S., Institute for Human Factors TNO, Netherlands; Apr. 12, 2001; 40p; In Dutch

Contract(s)/Grant(s): 013.20344.03; TNO Proj. 790.3

Report No.(s): TD2001-0132; TM-01-A028; Copyright; Avail: Issuing Activity

When tactical commanders are confronted with complex or unfamiliar command-and-control situations, they use their domain knowledge to construct an initial interpretation of the situation. This interpretation is adjusted and refined by evaluating available information, by searching for consistency, and by critically testing underlying assumptions. The expert's approach is used to develop training in critical thinking. Trainees learn to integrate observations, information and assumptions into a comprehensive account of the situation (story). This should enable them to identify missing information and possible inconsistencies. Under contract of the Netherlands Ministry of Defence, TNO Human Factors investigated the effects of training in scenario-based critical thinking exercises on the quality of tactical command. Participants played the role of "battle captain/shift leader" in air defence missions. The experimenter introduced events in the scenarios and played higher and lower control. One group received instruction and feedback in critical thinking. The other group received the same scenarios, but without support. After training, two test scenarios were administered to both groups. Critical thinking training produced positive effects on the process of tactical command (i.e. better argumentation for situation assessment) as well as on the outcomes (i.e. more and better contingency plans). Training in critical thinking supports officers in acquiring skill in situation assessment, in plan development, and in anticipating unexpected events. Further research is needed to investigate the training approach in more natural task environments.

Author

Command and Control; Human Factors Engineering; Decision Making; Military Psychology; Cognition; Information Processing (Biology)

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..

20010083354 NASA Ames Research Center, Moffett Field, CA USA

Rotary Wing Flight Test Methods Used for the Evaluation of Night Vision Devices

Haworth, Loran, NASA Ames Research Center, USA; Blanken, Christopher, NASA Ames Research Center, USA; Szoboszlai, Zoltan, NASA Ames Research Center, USA; [2001]; 1p; In English; AeroSense, April 2000, Orlando, FL, USA; Sponsored by

International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A number of rotary wing flight tests have been conducted by the Army Aeroflightdynamics Directorate in cooperation with NASA which involved the use of night vision devices and simulated devices. The test set up and data analysis have been taken from two perspectives. Some of the flight tests were structured to look at aircraft handling qualities when the pilot's image quality was reduced from normal daylight levels. In this case, aircraft flight path information was given to the pilot as one input into the Handling Qualities Ratings. Other flight tests were structured to look at pilot and workload directly. In this second case, aircraft position was accurately measured and used as pilot performance data. This paper provides an overview of the test methods used, lessons learned, and recommendations for future tam of night vision devices.

Author

Flight Tests; Night Vision; Rotary Wings; Display Devices

20010083359 NASA Ames Research Center, Moffett Field, CA USA

Dynamic Modeling of Off-Nominal Operation in Advanced Life Support Systems

Jones, Harry, NASA Ames Research Center, USA; [2000]; 1p; In English; International Conference on Environmental Systems, 9-12 Jul. 2001, Orlando, FL, USA

Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: Issuing Activity; Abstract Only

System failures, off-nominal operation, or unexpected interruptions in processing capability can cause unanticipated instabilities in Advanced Life Support (ALS) systems, even long after they are repaired. Much current modeling assumes ALS systems are static and linear, but ALS systems are actually dynamic and nonlinear, especially when failures and off nominal operation are considered. Modeling and simulation provide a way to study the stability and time behavior of nonlinear dynamic ALS systems under changed system configurations or operational scenarios. The dynamic behavior of a nonlinear system can be fully explored only by computer simulation over the full range of inputs and initial conditions. Previous simulations of BIO-Plex in SIMULINK, a toolbox of Matlab, were extended to model the off-nominal operation and long-term dynamics of partially closed physical/chemical and bioregenerative life support systems. System nonlinearity has many interesting potential consequences. Different equilibrium points may be reached for different initial conditions. The system stability can depend on the exact system inputs and initial conditions. The system may oscillate or even in rare cases behave chaotically. Temporary internal hardware failures or external perturbations in ALS systems can lead to dynamic instability and total ALS system failure. Appropriate control techniques can restore reliable operation and minimize the effects of dynamic instabilities due to anomalies or perturbations in a life support system.

Author

Life Support Systems; Systems Engineering; Dynamic Models; Computerized Simulation

20010083374 NASA Ames Research Center, Moffett Field, CA USA

Dynamic Model of the BIO-Plex Air Revitalization System

Finn, Cory, NASA Ames Research Center, USA; Meyers, Karen, Lockheed Martin Corp., USA; Duffield, Bruce, Lockheed Martin Corp., USA; [2000]; 1p; In English; International Conference on Environmental Systems, 9-12 Jul. 2001, Orlando, FL, USA

Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: Issuing Activity; Abstract Only

The BIO-Plex facility will need to support a variety of life support system designs and operation strategies. These systems will be tested and evaluated in the BIO-Plex facility. An important goal of the life support program is to identify designs that best meet all size and performance constraints for a variety of possible future missions. Integrated human testing is a necessary step in reaching this goal. System modeling and analysis will also play an important role in this endeavor. Currently, simulation studies are being used to estimate air revitalization buffer and storage requirements in order to develop the infrastructure requirements of the BIO-Plex facility. Simulation studies are also being used to verify that the envisioned operation strategy will be able to meet all performance criteria. In this paper, a simulation study is presented for a nominal BIO-Plex scenario with a high-level of crop growth. A general description of the dynamic mass flow model is provided, along with some simulation results. The paper also discusses sizing and operations issues and describes plans for future simulation studies.

Author

Dynamic Models; Life Support Systems; Air Purification; Computerized Simulation

20010084637 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA

Effect of Viewing Conditions on Sickness and Distance Estimation in a Virtual Environment *Final Report, Sep. 1998 - May 1999*

Ehrlich, Jennifer A.; Feb. 2000; 48p; In English

Contract(s)/Grant(s): Proj-A790

Report No.(s): AD-A390448; ARI-TR-1112; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Previous research indicates that Helmet Mounted Displays (HMDs) using stereoscopic presentation techniques induce greater Simulator Sickness symptomology than a biocular presentation. However, neither of these presentation methods takes into account the different perspective each eye normally receives as a result of each eye turning to fixate on objects in different depth planes, referred to as vergence movements. The present study examined the effects of a vergence algorithm moderating the stereoscopic display in an HMD in a within subjects comparison to standard stereoscopic and biocular presentations. The experiment used a distance estimation task and the other major variable was incidence of simulator sickness. The experiment task required moving through rooms in a virtual environment and providing distance estimates to different objects. The findings suggest that most participants would recover more easily from simulator sickness symptoms with a vergence viewing condition. However, because this study shows a wide range of individual differences, a vergence adjustment to stereoscopic presentation should not be expected to eliminate the number of participants withdrawing, but only to reduce their number when repeated exposures are involved. Also, the range of individual differences indicates a need for multiple measures of symptomology not only to help identify individuals who are under duress, but to better assess when they have adapted. One candidate measure of duress is dark vergence, based on its objective scaling, its relevance to adaptation, and its correlation with 55 sub-scale scores.

DTIC

Viewing; Motion Sickness; Helmet Mounted Displays

20010084638 Navy Experimental Diving Unit, Panama City, FL USA

Development of Oxygen Monitoring Capability for the Existing Hyperbaric Carbon Dioxide Analyzer Used in Dry Deck Shelter Operations, Sep. 1998 - Oct. 1999

Lillo, R. S.; Porter, W. R.; Caldwell, J. M.; Jan. 2001; 44p; In English

Contract(s)/Grant(s): Proj-M0099

Report No.(s): AD-A390454; NEDU-TR-01-01; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Dry Deck Shelter (DDS) is a hyperbaric system used on submarines to transport SEAL delivery vehicles into an operating area. The system uses air from submarine banks to ventilate the DDS for carbon dioxide (CO₂) removal and provide breathing air to the divers. In order to improve the efficiency of ventilation, we previously developed a portable hyperbaric analyzer for monitoring CO₂ within DDSs. This analyzer was approved by NAVSEA (PMS-399) in 1998 as the primary control of ventilation during DDS operations. However, when divers operating from the DDS develop decompression sickness, they can be treated in the chamber compartment of the DDS using recompression and oxygen O₂ for breathing via masks connected to the built-in-breathing System (BIBS). Concern exists about leakage of O₂ from the masks producing a rise in the O₂ levels within the chamber, thus increasing the fire hazard. Consequently, we were tasked to add an O₂ monitoring capability to the hyperbaric CO₂ analyzers now used inside the DDS. preliminary laboratory testing of candidate O₂ sensors allowed selection of a commercially available sensor, which was then incorporated into the CO₂ analyzer. Experiments evaluating the performance of the CO₂/O₂ analyzer in the laboratory demonstrated O₂ accuracy of +5% relative over 1-4 atmospheres absolute (ATA), although greater error at 5-6 ATA, and confirmed previously reported CO₂ accuracy of +10% relative over the same pressure range. Because neither long-term testing nor field evaluation of the CO₂/O₂ analyzers has been performed, analyzer reliability will need to be followed carefully during any transition to Fleet use. In addition to meeting the requirements for O₂ and CO₂ measurement during DDS operations, this analyzer may also fill the existing need for reliable O₂ and CO₂ measurement inside other types of hyperbaric chambers and diving apparatus.

DTIC

Oxygen; Drying; Shelters; Transport Vehicles; Gas Analysis

20010084640 Army Research Inst. of Environmental Medicine, Thermal and Mountain Medicine Div., Natick, MA USA

A Mixed-Gas Control System for an Environmental Chamber Final Report

DeGroot, David W.; Blanchard, Laurie A.; Apr. 2001; 14p; In English

Report No.(s): AD-A390457; USARIEM-TN-01/3; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In order to simulate the expected environmental conditions in a submarine that has become disabled (i.e., loss of electrical power and subsequent inability to control temperature, humidity, and oxygen and carbon dioxide levels), a system was created to control the oxygen and carbon dioxide concentration of an environmental chamber. The study protocol called for a baseline testing period of ambient environmental conditions for 2 days (20 C, 50% RH, 20.93% O₂, 0.04% CO₂), followed by a 24-hour transition phase to the disabled conditions (4 C, 80% RH, 16.75% O₂, 2.50% CO₂), which were maintained for 5 days. Due to numerous design factors, the hypobaric chamber facility was chosen to conduct this study, since the facility met all of the needs of the study except for the ability to control oxygen and carbon dioxide levels, which none of the institute's chambers are normally

capable of. Reduced oxygen content was achieved by displacement with nitrogen, and increased carbon dioxide content was achieved by injection of 100% carbon dioxide and metabolic carbon dioxide production. The oxygen and carbon dioxide content of the chamber was continually monitored and controlled by a custom designed software system. During the 5 day 'disabled' portion of the study, chamber conditions were as follows: temp 4.51 +/- 0.56 C; relative humidity 80.48 +/- 5.27% RH; oxygen 16.73 +/- 0.06% and carbon dioxide 2.49 +/- 0.04%. Variations in temperature, oxygen and carbon dioxide levels, as indicated by the standard deviation, were all within desired limits (+/- 1.0 C; +/- 0.10% concentration). Relative humidity was outside the desired limit of +/- 3.0% R.

DTIC

Gas Mixtures; Carbon Dioxide Concentration; Oxygen; Air Quality; Computer Programs; Quality Control; Control

20010084721 NASA Ames Research Center, Moffett Field, CA USA

Artificial Gravity for Mars Missions: The Different Design and Development Options

Murbach, Marcus, NASA Ames Research Center, USA; Arno, Roger D., NASA Ames Research Center, USA; May 01, 2000; 1p; In English; 30th ICES Conference, Jul. 2000, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

One of the major impediments to human Mars missions is the development of appropriate countermeasures for long term physiological response to the micro-gravity environment. A plethora of countermeasure approaches have been advanced from strictly pharmacological measures to large diameter rotating spacecraft that would simulate a 1-g environment (the latter being the most conservative from a human health perspective). The different approaches have significantly different implications not only on the overall system design of a Mars Mission Vehicle (MMV) but on the necessary earth-orbiting platform that would be required to qualify the particular countermeasure system. It is found that these different design options can be conveniently categorized in terms of the order of magnitude of the rotation diameter required (100's, 10's, 1's, 0 meters). From this, the different mass penalties associated with each category can be generally compared. The overall objective of the countermeasure system should be to maximize crew safety and comfort, minimize exercise protocol time (i.e., the time per day that each crew member would have to participate in the exercise/countermeasure), maximize countermeasure effectiveness, and minimize the associated system mass penalty of the Mars Mission Vehicle (in terms of fraction of IMLEO - Injected Mass in Low Earth Orbit).

Author

Mars Missions; Microgravity; Artificial Gravity; Aerospace Vehicles; Countermeasures; Design Analysis; Systems Engineering

20010084780 National Defence Research Establishment, Div. of Human Sciences, Linköping, Sweden

Effects of Hypergravity and Anti-G-Suit Pressurization on Inter- and Intraregional Ventilation Inhomogeneity during Tidal Breathing *Inter-Och Intraregional Ventilationsfördelning Under Tidalandning Vid Oekad G-Belastning Och Trycksättning av en Anti-G-Dräkt*

Groenkvist, M.; Bergsten, E.; Eiken, O.; Koelegaerd, R.; Lindborg, B.; Dec. 2000; ISSN 1104-9154; 30p; In English Report No.(s): PB2001-107286; FOA-R-00-01737-720-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effects of increased gravity in the head-to-foot direction (+Gz) and anti-G suit (AGS) pressurization on inter- and intraregional ventilation inhomogeneity during normal breathing were explored in 12 healthy male subjects. They performed multiple breath washouts of SF6 and He at +1Gz, +Gz or +3Gz in a human centrifuge, while wearing an AGS pressurized to 0, 6 or 12 kPa. The normalized phase III slopes from the expired tracer gases were used to determine the contributions of inter- and intraregional inhomogeneity to overall ventilation inhomogeneity. Total inhomogeneity increased with increasing +Gz. Intraregional inhomogeneity was the major contributor to overall inhomogeneity in hypergravity, and showed a greater and more significant increase with gravity than interregional inhomogeneity. AGS pressurization produced impaired inter- and intraregional ventilation distribution in normogravity, but resulted in improved homogeneity in hypergravity.

NTIS

Pressure Breathing; Gravitational Effects; Respiration; Flight Crews; Pressure Suits

20010085807 NASA Johnson Space Center, Houston, TX USA

Advanced Power and Propulsion: Insuring Human Survival and Productivity in Deep Space Missions

Chang-Diaz, Franklin R., NASA Johnson Space Center, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 46; In English; See also 20010085800; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Dr. Chang-Diaz gave an intriguing presentation of his research in advanced rocket propulsion and its relevance for planning and executing crewed deep space explorations. Though not necessarily exclusively Martian, his thrust looks critically at future Mars missions. Initially Dr. Chang-Diaz showed the time constraints of Mars missions due to orbital mechanics and our present chemically powered rocket technology. Since essentially all the energy required to place current generation spacecraft into a

Martian trajectory must be expended in the early minutes of a flight, most of such a mission is spent in free-fall drift, captive to the gravitational forces among Earth, the Sun, and Mars. The simple physics of such chemically powered missions requires nearly a year in transit for each direction of a Mars mission. and the optimal orientations of Earth and Mars for rendezvous require further time on or around Mars to await return. These extensions of mission duration place any crew under a three-fold jeopardy: (1) physiological deconditioning (which in some aspects is still unknown and unpreventable), (2) psychological stress, and (3) ionizing radiation. This latter risk is due to exposure of crew members for extended time to the highly unpredictable and potentially lethal radiations of open space. Any gains in shortening mission duration would reap equivalent or greater benefits for these crew concerns. Dr. Chang-Diaz has applied his training and expertise (Ph.D. from Massachusetts Institute of Technology in applied plasma physics) toward development of continuous rocket propulsion which would offer great time advantages in travel, and also more launch options than are now available. He clearly explained the enormous gains from a relatively low thrust accelerative force applied essentially continuously versus the high, but short-lived propulsion of present chemical rockets. In fact, such spacecraft could be powered throughout the mission, accelerating to approximately the midpoint and decelerating during the latter half. This would not only provide some level of gravity (acceleration) throughout the mission but also allow very high velocities to be achieved, thus saving many months of travel time. In proposing the design of such a spacecraft propulsion system, Dr. Chang-Diaz was quick to acknowledge the need for a large power source, which undoubtedly must be nuclear fueled at the solar distances involved. He calls his system the Variable Specific Impulse Magnetoplasma Rocket (VASIMR). The other major ingredient is a mass (deuterium, which could also function as a radiation shield for crews) for energizing into the ultra hot, high velocity exhaust plasma. He foresees models now functional in the laboratory soon to be tested in space. In fact, some of these concepts have already been tried there. His optimism and determination would have operational rockets in the next decades.

Author

Space Exploration; Space Missions; Spacecraft Propulsion; Vasimr (Propulsion System)

20010085810 California Univ., USA

An Overview of the Final OSHA Ergonomics Standard

Perez, Graciela M., California Univ., USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 57-59; In English; See also 20010085800; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

This viewgraph presentation gives an overview of the final Occupational Safety and Health Administration's (OSHA's) Ergonomics Standard, including information on the program's scope (industrial but not construction, maritime, or agricultural), options ('quick fix' or full program), a compliance timeline, the Grandfather clause's impact on the program, current legal issues, and OSHA resources.

Author

Public Health; Human Factors Engineering; Standards

20010085954 Institute for Human Factors TNO, Soesterberg, Netherlands

Reconnaissance Mission Fennek and Criteria for Crew Selection: Interim Report *Interim Report Verkenningmissie Fennek en Selectie-Eisen Bemanning: Tussenrapport*

Boer, L. C., Institute for Human Factors TNO, Netherlands; deKok, H. J., Institute for Human Factors TNO, Netherlands; Wertheim, A. H., Institute for Human Factors TNO, Netherlands; Mar. 27, 2001; 24p; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): 013.10355; TNO Proj. 787.1

Report No.(s): TD2001-0128; TM-01-A024; Copyright; Avail: Issuing Activity

The Royal Netherlands Army (RNLA) plans a wholly new type of reconnaissance mission for which acquisition of a new vehicle is required, possibly the wheel vehicle "Fennek-LVB" (named after a desert fox). The RNLA wants to know whether the future crew of this vehicle needs to satisfy special criteria. We made an inventory of the Fennek and its many advanced (sensor) equipment with, among others, video reels from a load test. We subsequently developed an example scenario of a reconnaissance mission, which was discussed repeatedly with RNLA experts and revised accordingly. The ultimate "story of a new reconnaissance mission" is a good guide for interviews scheduled for the year 2001 with experienced military personnel. The results of these interviews will then be translated into criteria for personnel selection. The ultimate scenario represents the characteristic elements of a reconnaissance mission. Points of special importance for assessment of the mental load of the reconnaissance crew are indicated along with the scenario. In the year 2001 "walk through"/"talk through" interviews will take

place with experienced personnel. What they indicate as mentally loading will be compared with the general criteria for soldiers in fighting positions.

Author

Personnel Selection; Reconnaissance; Mental Performance; Performance Tests; Workloads (Psychophysiology)

20010086580 Civil Aerospace Medical Inst., Oklahoma City, OK USA

Investigating the Validity of Performance and Objective Workload Evaluation Research (POWER) Final Report

Manning, Carol A., Civil Aerospace Medical Inst., USA; Mills, Scott H., SBC Technology, USA; Fox, Cynthia, Civil Aerospace Medical Inst., USA; Pfeiderer, Elaine, Civil Aerospace Medical Inst., USA; Mogilka, Henry J., FAA Academy, USA; July 2001; 48p; In English

Contract(s)/Grant(s): AM-B-00-HRR-516

Report No.(s): DOT/FAA/AM-01/10; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Performance and Objective Workload Evaluation Research (POWER) software was developed to provide objective measures of ATC task load and performance. POWER uses data extracted from National Airspace System (NAS) System Analysis Recording (SAR) files to compute a set of objective measures. A study was conducted to investigate the relationship of POWER measures with measures of sector complexity, controller Workload, and performance. Sixteen instructors from the FAA Academy in Oklahoma City, OK, watched eight traffic samples from four en route sectors in the Kansas City Center using the Systematic Air Traffic Operations Research Initiative (SATORI) system. POWER measures were computed using the same data. Participants made three estimates of the workload experienced by radar controllers and provided two types of assessments of their performance. Sector complexity was determined using information about sector characteristics and the traffic samples. Some POWER measures were related to sector complexity and controller workload, but the relationship with performance was less clear. While this exploratory study provides important information about the POWER measures, additional research is needed to better understand these relationships. When the properties and limitations of these measures are better understood, they may then be used to calculate baseline measures for the current National Airspace System.

Author

Workloads (Psychophysiology); Controllers; Systems Analysis; Tasks; Air Traffic Control; Human Performance

20010087126 Defence Science and Technology Organisation, Combatant Protection and Nutrition Branch, Fishermans Bend, Australia

Army Recruit Health and Diet Survey

Booth, Christine, Defence Science and Technology Organisation, Australia; Coad, Ross, Defence Science and Technology Organisation, Australia; July 2001; 50p; In English

Report No.(s): DSTO-RR-0215; DODA-AR-011-931; Copyright; Avail: Issuing Activity

During 1998, 200 Army recruits took part in a health and diet survey. Most (90%) were Regular Army recruits and recent high school graduates, the remainder being Army Reservists. Fourteen percent of recruits were female. Recruits completed a questionnaire, had their weight and height recorded and donated a fasting blood sample for measurement of cholesterol, fasting triglycerides, apolipoprotein B, ferritin, homocysteine and vitamins. The group comprised of apparently healthy young adults, mostly in the ideal body weight range, with a high rate of participation in organized sports and a high rate of smoking (26%). The dietary intake by these recruits, which was similar to that of other young adults in the general Australian population, was too high in fat and unbalanced with respect to the recommended core food groups. Recruits were at risk of eating insufficient calcium, magnesium and zinc. Female recruits were at risk of eating insufficient iron. Biochemistry results revealed a significant prevalence of folate, thiamin and riboflavin deficiency for males and females and iron deficiency amongst the females. Up to half of the recruits had at least one risk factor for cardiovascular disease, namely elevated cholesterol, triglycerides, apolipoprotein B or homocysteine concentration. Nutrition education should be targeted at lowering the prevalence of cardiovascular risk factors amongst Army personnel and addressing the special dietary needs of female personnel.

Author

Health; Diets; Nutrients; Armed Forces; Nutrition

20010088231 Institute of Space Medico-Engineering, Beijing, China

Effects of Running Armored Car on Dynamic Posture Equilibrium

Gu, Hua-Guang, Institute of Space Medico-Engineering, China; Pei, Jing-Chen, Institute of Space Medico-Engineering, China; Zhou, Feng-Shu, Institute of Space Medico-Engineering, China; Shen, Xing-Yun, Institute of Space Medico-Engineering, China; Zhang, Yan-Ping, Institute of Space Medico-Engineering, China; Zhang, Zong-Lin, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 107-110; In Chinese;

Copyright; Avail: Issuing Activity

Objective: to study the effects of training in running armored car on dynamic posture equilibrium. Method: Dynamic posture, was tested pre- and post running armored car in 56 healthy men. Result: Compared to pre-training, certain equilibrium scores of sensory organization test condition 1(P is less than 0.05) 2(P is less than 0.001), and 3(P is less than 0.001) decreased significantly, while those of condition 4(P is less than 0.001) and 6(P is less than 0.001) increased significantly. The static proprioception score (SOT2/SOT1 x 100) (P is less than 0.01) decreased significantly, while visual sensory score (SOT4/SOT1 x 100, P is less than 0.01) and dynamic proprioception(SOT(4 + 5 + 6)/SOT(1 + 2 + 3) x 100, P is less than 0.001) increased significantly post-training. The motor strategy scores of sensory organization test condition 2(P is less than 0.01) and 3 (P is less than 0.001) significantly decreased. Conclusion: The results demonstrated that training in a running armored car influenced postural equilibrium and sensory organization.

Author

Military Vehicles; Posture; Attitude (Inclination); Proprioception

20010088358 Institute of Space Medico-Engineering, Beijing, China

Ergonomic Research on Crew Module Layout in Manned Spacecraft System

Zhou, Qian-Xiang, Institute of Space Medico-Engineering, China; Jiang, Guo-Hua, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 144-148; In Chinese; Copyright; Avail: Issuing Activity

The structural layout of crew module in manned spacecraft is one of the main factors related to its man-machine interface. Not only the mechanic characters of equipment in it, but also the human engineering factors should be taken into consideration. According to the history of manned spaceflight, the structural layout development, general rules and main objects for research are expounded in detail, on the basis of which some views on its development trends are put forward for discussion.

Author

Spacecraft Modules; Manned Spacecraft; Human Factors Engineering; Spacecrews; Spacecraft Cabins; Layouts

20010088846 Institute of Space Medico-Engineering, Beijing, China

Prospect of the Advanced Life Support Program Breadboard Project at Kennedy Space Center in USA

Guo, Shuang-Sheng, Institute of Space Medico-Engineering, China; Ai, Wei-Dang, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 149-153; In Chinese; Copyright; Avail: Issuing Activity

The Breadboard Project at Kennedy Space Center in NASA of USA was focused on the development of the bioregenerative life support components, crop plants for water, air, and food production and bioreactors for recycling of wastes. The keystone of the Breadboard Project was the Biomass Production Chamber(BPC), which was supported by 15 environmentally controlled chambers and several laboratory facilities holding a total area of 2150 sq m. In supporting the Advanced Life. Support Program(ALS Program), the Project utilizes these facilities for large-scale testing of components and development of required technologies for human-rated testbeds at Johnson Space Center in NASA, in order to enable a Lunar and a Mars mission finally.

Author

Life Support Systems; Breadboard Models; Bioreactors; Recycling; Farm Crops; Biomass

55

EXO BIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see 52 Aerospace medicine; on animals and plants see 51 Life Sciences. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science.

20010084625 NASA Ames Research Center, Moffett Field, CA USA

An Overview of Astrobiology and Computational Astrobiology

Pohorille, Andrew, NASA Ames Research Center, USA; Jul. 24, 2000; 1p; In English; Artificial Life VIII, 1-4 Aug. 2000, Portland, OR, USA

Contract(s)/Grant(s): RTOP 344-50-92-02; No Copyright; Avail: Issuing Activity; Abstract Only

This talk will provide an introduction to the goals of the Astrobiology program and outline some areas of interest to theoreticians and computer modelers. The contents of the talk will be I taken from the Astrobiology Roadmap, reports to the

Astrobiology Institute and information, available from the Center for Computational Astrobiology web site (<http://cca.arc.nasa.gov>).

Author

Exobiology; Numerical Analysis; Mathematical Models

59

MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see categories 60 through 67.

20010084307 National Inst. of Standards and Technology, Applied and Computational Mathematics Div., Gaithersburg, MD USA

Constructing Sibson Elements for a Rectangular Mesh

Gilsinn, D. E.; Feb. 28, 2001; 28p; In English

Report No.(s): PB2001-102792; NISTIR-6718; No Copyright; Avail: National Technical Information Service (NTIS)

This paper documents the construction of a finite element, called the Sibson element. The shape function of this element is formed on rectangular grids by $C(\text{sub } 1)$ splines defined on a triangulation of each subrectangle by dividing it into four subtriangles formed by drawing the diagonals. The splines are constructed from bivariate cubic polynomials $z(x,y)$ and are written in such a way that they are linear functions of the values z , $\Delta z/\Delta x$, $\Delta z/\Delta y$ at each node of the rectangle with bivariate polynomial coefficients up to order three. Conditions are given for the existence of such an element. They are used to construct the bivariate polynomial coefficients, first for a unit rectangle and then for a general rectangle. Since the first and second derivatives of these functions are sometimes needed they are also given.

NTIS

Shape Functions; Finite Element Method; Polynomials; Computational Grids

20010085952 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Gauss-Manin Connection on the Hodge Structures

Rovinsky, M.; May 2000; 20p; In English

Report No.(s): PB2001-105846; IHES/M/00/40; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contents include the following: The absolute GauB-Manin connection: definition; Basic properties of the GaaB-Manin connection; Example: some Hodge structures of rank equal to or greater than 3 (Pure Hodge structures of rank 2, Pure Hodge structures of rank 3; Hodge structures of rank 3 and weights $-k$ for k equal to or greater than 2 and 0; Hodge structures of rank 3 and weights -1 and 0); Hodge-Tate structures (Calculation of the connection on the logarithmic structures, The GauB-Manin connection on arbitrary Hodge-Tate structures References).

NTIS

Gauss Equation; Logarithms

60

COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 Electronics and Electrical Engineering. For computer vision see 63 Cybernetics, Artificial Intelligence and Robotics.

20010083383 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK

Exploiting Formality Within an Architectural Design Method

Paynter, S.; Armstrong, J.; Haveman, J.; Jul. 2000; 36p; In English

Report No.(s): PB2001-106875; CS-TR-690; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The paper argues that formal methods need to be properly integrated into an architectural design method if they are to be successfully transferred into industrial practice. It outlines a number of issues which need to be considered when performing such integration, and illustrates these points by reference to the formal techniques for complex high-integrity real-time systems being developed in the British Aerospace Dependable Computing Systems Center.

NTIS

Architecture (Computers); Airborne/Spaceborne Computers; Complex Systems; Aerospace Systems

20010083384 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK

Randomized Multivalued Consensus

Ezhilchelvan, P.; Mostefaoui, A.; Raynal, M.; Jul. 2000; 22p; In English

Report No.(s): PB2001-106874; CR-TR-702; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The Consensus problem is a fundamental problem one has to solve to implement reliable services or applications on top of asynchronous distributed systems prone to failures. Unfortunately, this problem cannot be solved in those systems as soon as one process can crash (Fischer-Lynch-Paterson's impossibility result). Two approaches have been investigated to circumvent this impossibility result. Both consist in enriching the underlying system with appropriate 'oracles'. The Unreliable Failure Detector concept proposed by Chandra and Toueg constitutes one family of such oracles. The other family of oracles consists in allowing each process to use a random number generator. In that case, the protocol termination is only probabilistic. A few randomized consensus protocols for message-passing asynchronous distributed systems have been proposed. Moreover, they consider that processes can only propose values from a binary set. This paper proposes a new randomized consensus protocol that allows processes to propose arbitrary values. Contrarily to other randomized consensus protocols, the proposed protocol does not require the a priori knowledge of the set of values that can be proposed by processes. It relies on a relatively simple combination of randomization and reliable broadcast.

NTIS

Distributed Parameter Systems; Synchronism; Failure

20010083385 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK

Fault Injection Based Assessment of Fail-Silence Provided by Process Duplication versus Internal Error Detection

Stott, D. T.; Speirs, N. A.; Xu, J.; Bagchi, S.; Whisnant, K.; Jul. 2000; 34p; In English

Report No.(s): PB2001-106869; CS-TR-694; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

In this paper, two software-based architectures for providing fail-silent processes, Voltan and Chameleon ARMORs, and analyzed using fault injection. The goal is to compare the fail-silence coverage provided by the internal error detection techniques in Chameleon ARMORs with an ideal case of full duplication provided by Voltan.

NTIS

Architecture (Computers); Software Development Tools; Errors; Detection

61

COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20010083844 NASA Ames Research Center, Moffett Field, CA USA

Bioelectric Control of a 757 Class High Fidelity Aircraft Simulation

Jorgensen, Charles, NASA Ames Research Center, USA; Wheeler, Kevin, NASA Ames Research Center, USA; Stepniewski, Slawomir, RECOM Technologies, Inc., USA; [2000]; 9p; In English; WAC 2000, 11-16 Jun. 2000, Maui, HI, USA

Contract(s)/Grant(s): NAS2-14217; RTOP 519-30-12; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper presents results of a recent experiment in fine grain Electromyographic (EMG) signal recognition. We demonstrate bioelectric flight control of 757 class simulation aircraft landing at San Francisco International Airport. The physical instrumentality of a pilot control stick is not used. A pilot closes a fist in empty air and performs control movements which are captured by a dry electrode array on the arm, analyzed and routed through a flight director permitting full pilot outer loop control of the simulation. A Vision Dome immersive display is used to create a VR world for the aircraft body mechanics and flight changes to pilot movements. Inner loop surfaces and differential aircraft thrust is controlled using a hybrid neural network architecture that combines a damage adaptive controller (Jorgensen 1998, Totah 1998) with a propulsion only based control system (Bull & Kaneshige 1997). Thus the 757 aircraft is not only being flown bioelectrically at the pilot level but also demonstrates damage adaptive neural network control permitting adaptation to severe changes in the physical flight characteristics of the aircraft at the inner loop level. To compensate for accident scenarios, the aircraft uses remaining control surface authority and differential thrust from the engines. To the best of our knowledge this is the first time real time bioelectric fine-grained control, differential thrust based control, and neural network damage adaptive control have been integrated into a

single flight demonstration. The paper describes the EMG pattern recognition system and the bioelectric pattern recognition methodology.

Author

Bioelectricity; Boeing 757 Aircraft; Aircraft Landing; Electromyography; Flight Control

20010083964 NASA Langley Research Center, Hampton, VA USA

Distributed Relaxation for Conservative Discretizations

Diskin, Boris, Institute for Computer Applications in Science and Engineering, USA; Thomas, James L., NASA Langley Research Center, USA; 2001; 11p; In English; 15th AIAA Computational Fluid Dynamics Conference, 11-14 Jun. 2001, Anaheim, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAS1-97046

Report No.(s): AIAA Paper 2001-2571; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A multigrid method is defined as having textbook multigrid efficiency (TME) if the solutions to the governing system of equations are attained in a computational work that is a small (less than 10) multiple of the operation count in one target-grid residual evaluation. The way to achieve this efficiency is the distributed relaxation approach. TME solvers employing distributed relaxation have already been demonstrated for nonconservative formulations of high-Reynolds-number viscous incompressible and subsonic compressible flow regimes. The purpose of this paper is to provide foundations for applications of distributed relaxation to conservative discretizations. A direct correspondence between the primitive variable interpolations for calculating fluxes in conservative finite-volume discretizations and stencils of the discretized derivatives in the nonconservative formulation has been established. Based on this correspondence, one can arrive at a conservative discretization which is very efficiently solved with a nonconservative relaxation scheme and this is demonstrated for conservative discretization of the quasi one-dimensional Euler equations. Formulations for both staggered and collocated grid arrangements are considered and extensions of the general procedure to multiple dimensions are discussed.

Author (AIAA)

Discretization (Mathematics); Compressible Flow; Multigrid Methods; Computational Fluid Dynamics; Euler Equations of Motion; Conservation Equations; Nonlinear Equations; Linearization; Relaxation Method (Mathematics); Discrete Functions; Inviscid Flow

20010084145 NASA Ames Research Center, Moffett Field, CA USA

Automated Theorem Proving in High-Quality Software Design

Schumann, Johann, NASA Ames Research Center, USA; [2001]; 18p; In English

Contract(s)/Grant(s): Schu908/5-1; Schu908/5-2; SFB-342/A5; RTOP 519-50-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The amount and complexity of software developed during the last few years has increased tremendously. In particular, programs are being used more and more in embedded systems (from car-brakes to plant-control). Many of these applications are safety-relevant, i.e. a malfunction of hardware or software can cause severe damage or loss. Tremendous risks are typically present in the area of aviation, (nuclear) power plants or (chemical) plant control. Here, even small problems can lead to thousands of casualties and huge financial losses. Large financial risks also exist when computer systems are used in the area of telecommunication (telephone, electronic commerce) or space exploration. Computer applications in this area are not only subject to safety considerations, but also security issues are important. All these systems must be designed and developed to guarantee high quality with respect to safety and security. Even in an industrial setting which is (or at least should be) aware of the high requirements in Software Engineering, many incidents occur. For example, the Warsaw Airbus crash, was caused by an incomplete requirements specification. Uncontrolled reuse of an Ariane 4 software module was the reason for the Ariane 5 disaster. Some recent incidents in the telecommunication area, like illegal "cloning" of smart-cards of D2GSM handies, or the extraction of (secret) passwords from German T-online users show that also in this area serious flaws can happen. Due to the inherent complexity of computer systems, most authors claim that only a rigorous application of formal methods in all stages of the software life cycle can ensure high quality of the software and lead to real safe and secure systems. In this paper, we will have a look, in how far automated theorem proving can contribute to a more widespread application of formal methods and their tools, and what automated theorem provers (ATPs) must provide in order to be useful.

Derived from text

Software Engineering; Computer Programs; Theorem Proving; Telecommunication; Risk; Safety

20010084302 National Inst. of Standards and Technology, Time and Frequency Div., Boulder, CO USA

Technical Reference Manual for NIST Automated Computer Time Service (ACTS)

Levine, J.; Lombardi, M. A.; Nelson, L. M.; Zhang, V. S.; Jul. 2001; 102p; In English
Report No.(s): PB2001-107587; NISTIR-6611; No Copyright; Avail: Issuing Activity

The NIST Automated Computer Time Service (ACTS) allows users with analog modems and client software to synchronize their clocks to NIST time. This manual documents the system used by NIST to provide the service. When properly installed and operated, the system described in this manual can be used to provide a dial-up service identical to ACTS at any location. The ACTS system consists of two main components, the server and the monitor. The server is a PC-based device that can handle up to four incoming calls at one time. All callers who connect to the server are sent a synchronized ASCII time code. The monitor is also a PC-based device with an independent reference clock. The monitor continually queries the server (through the serial and telephone lines) and reports time code errors or server hardware failures. This manual is a comprehensive overview of the ACTS system. Chapter 1 is a general overview of the information ACTS provides to its users. Chapters 2 and 3 describe how to install and operate the server and monitor. Chapter 4 and 5 provide a technical reference for the server and monitor.

NTIS

Communication Networks; Manual Control; Personal Computers; Time Measurement

20010084304 Michigan Univ., School of Information and Library Studies, Ann Arbor, MI USA

Manufacturing Collaboratory Case Study

Wierba, Elizabeth E., Michigan Univ., USA; Finholt, Thomas A., Michigan Univ., USA; May 2001; 186p; In English
Report No.(s): PB2001-107250; NIST/GCR-01/811; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

This report summarizes the experience with a collaborative tool intervention within a component design group of an automobile parts manufacturing company. A team of geographically distributed design engineers used Microsoft NetMeeting for a period of six months. Before and after survey data, combined with observational and interview data from site visits, showed low adoption of NetMeeting, despite favorable attitudes toward the application. The report explores factors related to low adoption and also evaluates the intervention strategy used in the study. Results suggest that key features of NetMeeting, specifically synchronous application sharing, were not as valuable as expected for collaborations that spanned time zones, but were more widely used for local collaboration. The report concludes that workarounds already in use within the target team, such as transmitting engineering drawings as email attachments, were sufficiently successful to inhibit exploration and adoption of alternative collaboration tools-even when these tools had desirable features as described by the engineers.

NTIS

Software Engineering; Systems Engineering; Computer Aided Design; Distributed Processing; Manufacturing

20010084648 NASA Ames Research Center, Moffett Field, CA USA

Visibility of DCT Quantization Error: Effects of Display Resolution

Watson, Andrew B., NASA Ames Research Center, USA; Gale, Alan, San Jose State Univ., USA; Solomon, Joshua A., NASA Ames Research Center, USA; Ahumada, Albert J., Jr., NASA Ames Research Center, USA; [1994]; 1p; In English; Image Processing Symposium, 12-17 Jun. 1994, San Jose, CA, USA; Sponsored by Society for Information Display, USA
Contract(s)/Grant(s): RTOP 505-64-53; No Copyright; Avail: Issuing Activity; Abstract Only

As part of a program of research to understand the visibility of DCT quantization errors and thereby design optimal quantizers, we measured visibility of DCT quantization error as a function of display resolution in pixels/degree. Visibilities are consistent with a model incorporating effects of block size and spatial pooling.

Author

Discrete Cosine Transform; Errors; Counters; Resolution; Measurement

20010084726 NASA Ames Research Center, Moffett Field, CA USA

Visibility of DCT Basis Functions: Effects of Contrast Masking

Soloman, Joshua A., NASA Ames Research Center, USA; Watson, Andrew B., NASA Ames Research Center, USA; Ahumada, Albert, NASA Ames Research Center, USA; [1994]; 1p; In English; Image Processing Symposium, 12-17 Jun. 1994, San Jose, CA, USA; Sponsored by Society for Information Display, USA
Contract(s)/Grant(s): RTOP 505-64-53; No Copyright; Avail: Issuing Activity; Abstract Only

Current strategies for compressing images neglect to accommodate certain aspects of the human visual system. One such neglected aspect is contrast masking. Here we provide measurements of contrast masking within the framework of the discrete cosine transform (DCT). We describe how to optimize DCT-based compression with respect to contrast masking.

Author

Discrete Cosine Transform; Visibility

20010084926 Tennessee State Univ., Center of Excellence, Nashville, TN USA

Function Comparisons for PC Operating Systems

Holloway, Jim, Tennessee State Univ., USA; Wrenn, Charlie, Tennessee State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 83; In English; See also 20010084895; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Many personal computer users as well as those who must support PC users must deal with multiple operating systems. This poster, along with the handout, serves as a single reference for looking up how to complete a task in a particular operating system. This poster illustrates how to perform some basic functions when using the various Microsoft operating systems. The name of the function, such as "deleting a file", is listed, and the procedure for completing the function described for each of the operating systems. The poster serves as a reference and a copy of the poster is included with a handout that will be given to each visitor to the poster site. The handout gives details for the procedures outlined by the reference poster.

Author

Operating Systems (Computers); Personal Computers; Functions

20010084981 NASA Goddard Space Flight Center, Greenbelt, MD USA

Using Automation to Improve the Flight Software Testing Process

ODonnell, James R., Jr., NASA Goddard Space Flight Center, USA; Morgenstern, Wendy M., NASA Goddard Space Flight Center, USA; Bartholomew, Maureen O., NASA Goddard Space Flight Center, USA; 2001 Flight Mechanics Symposium; June 2001, pp. 295-309; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

One of the critical phases in the development of a spacecraft attitude control system (ACS) is the testing of its flight software. The testing (and test verification) of ACS flight software requires a mix of skills involving software, knowledge of attitude control, and attitude control hardware, data manipulation, and analysis. The process of analyzing and verifying flight software test results often creates a bottleneck which dictates the speed at which flight software verification can be conducted. In the development of the Microwave Anisotropy Probe (MAP) spacecraft ACS subsystem, an integrated design environment was used that included a MAP high fidelity (HiFi) simulation, a central database of spacecraft parameters, a script language for numeric and string processing, and plotting capability. In this integrated environment, it was possible to automate many of the steps involved in flight software testing, making the entire process more efficient and thorough than on previous missions. In this paper, we will compare the testing process used on MAP to that used on other missions. The software tools that were developed to automate testing and test verification will be discussed, including the ability to import and process test data, synchronize test data and automatically generate HiFi script files used for test verification, and an automated capability for generating comparison plots. A summary of the benefits of applying these test methods on MAP will be given. Finally, the paper will conclude with a discussion of re-use of the tools and techniques presented, and the ongoing effort to apply them to flight software testing of the Triana spacecraft ACS subsystem.

Author

Applications Programs (Computers); Program Verification (Computers); Spacecraft Control; Response Time (Computers)

20010085334 Computer Sciences Corp., Moffett Field, CA USA

A Public/Private Extension of Conway's Accessor Model

McCann, Karen M., Computer Sciences Corp., USA; Yarrow, Maurice, Computer Sciences Corp., USA; [2000]; 12p; In English Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We present a new object-oriented model for a Perl package, based on Damien Conway's 'accessor' model. Our model includes both public and private data; it uses strategies to reduce a package namespace, but still maintains a robust and error-trapped approach. With this extended model we can make any package data or functions 'private', as well as 'public'. (Note: 'namespace' in this context means all the names, variables and subs, associated with a package.)

Author

Object-Oriented Programming; Computer Programs; Data Management

20010085358 Oral Roberts Univ., Tulsa, OK USA

SRS Computer Animation and Drive Train System Final Report

Arthun, Daniel, Oral Roberts Univ., USA; Schachner, Christian, Oral Roberts Univ., USA; Sep. 01, 2001; 35p; In English
Contract(s)/Grant(s): NAG5-7378; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The spinning rocket simulator (SRS) is an ongoing project at Oral Roberts University. The goal of the SRS is to gather crucial data concerning a spinning rocket under thrust for the purpose of analysis and correction of the coning motion experienced by this type of spacecraft maneuver. The computer animation simulates a virtual, scale model of the component of the SRS that represents the spacecraft itself. This component is known as the (VSM), or virtual spacecraft model. During actual physical simulation, this component of the SRS will experience a coning. The goal of the animation is to cone the VSM within that range to accurately represent the motion of the actual simulator. The drive system of the SRS is the apparatus that turns the actual simulator. It consists of a drive motor, motor mount and chain to power the simulator into motion. The motor mount is adjustable and rigid for high torque application. A digital stepper motor controller actuates the main drive motor for linear acceleration. The chain transfers power from the motor to the simulator via sprockets on both ends.

Author

Spacecraft Models; Coning Motion; Simulators; Computerized Simulation; Computer Animation

20010085387 California Univ., Dept. of Environmental Sciences, Riverside, CA USA

Development of Pedotransfer Functions with Neural Network Models Final Report, 21 May 1999 - 20 May 2001

Leij, F. J.; Van Genuchten, M. T.; Jun. 12, 2001; 24p; In English

Contract(s)/Grant(s): DAAD19-99-1-0164

Report No.(s): AD-A392765; 39153-EV-1; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Unsaturated soil hydraulic properties determine the capacity of soils and rocks to retain and transmit water. Hydraulic properties may be needed in applications involving remediation and restoration of contaminated soils, trafficability of soils, flood control, and remotely sensed data. Current methods to measure hydraulic properties are perceived as inadequate to meet the data requirements for most (large scale) applications. Neural networks are used in our research to develop pedotransfer functions (PTFs) for the hierarchical estimation of hydraulic data from basic data such as soil texture and bulk density. Neural networks were calibrated on a database of more than 2000 soils. The predictions generally compared favorably with published PTFs. Especially noteworthy is the unsaturated hydraulic conductivity; we improved its prediction by almost half an order of magnitude compared to traditional methods. We have completed the computer program Rosetta to facilitate neural network based predictions of hydraulic parameters. The uncertainty of the estimates was shown to increase for lower water contents. We have also converted our database of soil hydraulic properties to Windows from DOS.

DTIC

Neural Nets; Soil Science; Computer Programs; Rocks; Water Flow

20010085931 Fort Valley State Coll., GA USA

Computer Networking Laboratory for Undergraduate Computer Technology Program Final Report, 31 Jul. 1999 - 8 Jan. 2000

Naghedolfeizi, Masoud; Oct. 30, 2000; 18p; In English

Contract(s)/Grant(s): F49620-99-1-0304; AF Proj. 4311

Report No.(s): AD-A392488; Rept-10-11-6-03-111-186; AFRL-SR-BL-TR-01-0356; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The primary purpose of this project was to establish a state-of-the art computer networking laboratory to support the department curriculum in the areas of data communications, computer networks, and Internet/Intranet programming through hands-on approaches. As stated in the project proposal, the laboratory would provide the necessary technological infrastructure for the department: (1) To improve the quality of education in the existing courses related to computer networks and data communications as well as other computer science courses such programming languages and computer hardware and software systems. (2) to design and implement an advanced level computer science course in computer networks and data communications. (3) to provide faculty the technological tools to conduct research programs. The construction of the lab initiated in August 1, 1999 and continued until September 15, 2000. The lab was constructed in three phases, namely, planning and design, purchasing and installation, and testing. Each phase was successfully carried out to completion by the project's Principal and Co-Principal investigators and valuable contributions from the department and the university administrators and staff.

DTIC

Computer Networks; Computer Programs; Laboratories; Communication Networks; Software Engineering

20010086478 NASA Goddard Space Flight Center, Greenbelt, MD USA

Lessons from Adaptive Level One Accelerator (ALOA) System Implementation

Patel, Umesh D., NASA Goddard Space Flight Center, USA; Brambora, Clifford, NASA Goddard Space Flight Center, USA; Ghuman, Parminder, NASA Goddard Space Flight Center, USA; Aug. 08, 2001; 22p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Adaptive Level One Accelerator (ALOA) system was developed as part of the Earth Science Data and Information System (ESDIS) project. The reconfigurable computing technologies were investigated for Level 1 satellite telemetry data processing to achieve computing acceleration and cost reduction for the next-generation Level 1 data processing systems. The MODIS instrument calibration algorithm was implemented using reconfigurable a computer. The system development process and the lessons learned throughout the design cycle are summarized in this paper.

Author

Spacecraft Instruments; Systems Engineering; Computers; Design Analysis

20010086581 Norwegian Defence Research Establishment, Kjeller, Norway

A Stochastic Two-Component Material Model: Documentation of an Implementation as FORTRAN 90 Subroutines in Autodyn En Stokastisk Tokomponent Materialmodell: Dokumentasjon av en Implementasjon som FORTRAN 90 Subrutiner I Autodyn

Soleng, Harald H., Norwegian Defence Research Establishment, Norway; Feb. 23, 2001; 54p; In English; Original contains color illustrations

Contract(s)/Grant(s): FFIBM Proj. 766

Report No.(s): FFI/RAPPORT-2001/01089; ISBN 82-464-0517-9; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We implement a two-component material model using subroutines in Autodyn-2D version 4.1.13. The code described by this document has been written in noweb. Both the computer code in FORTRAN 90 and Mathematica as well as the LATEX source of this document are automatically generated from noweb source code files.

Author

FORTRAN; Stochastic Processes; Mathematical Models; Computerized Simulation

20010086967 Defence Science and Technology Organisation, Information Technology Div., Salisbury, Australia

Experiences in the Development of EXC3ITE-Based HLA-Compliant Simulation Capabilities

Davies, Mike; Gabrisch, Carsten; Matthews, Karyn; Dunn, John M.; May 2001; 81p; In English

Report No.(s): AD-A392654; DSTO-TR-1147; DODA-AR-011-860; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Program Takari's Experimental C3I Technology Environment (EXC3ITE) will be key to the establishment of modelling and simulation architectures, practices and capabilities that are integrated with real C3I systems to support a range of military experimentation. The U.S. High Level Architecture (HLA) is one component of an emerging encapsulation and architectural standard for simulation that has been mandated within the U.S. DoD. EXC3ITE and the HLA share two main principles of interoperability and reuse; they are both middleware-rich. This commonality needs to be exploited in order to make best use of the HLA standard. EXC3ITE-based HLA-compliant simulation capabilities were recently developed employing a combination of Adacel Technologies and Aspect Computing staff. This report describes the capabilities developed and experiences gained and raises issues and recommendations on the way ahead for EXC3ITE-based simulation and synthetic environments.

DTIC

Command and Control; Communication; Distributed Processing; Architecture (Computers); Object-Oriented Programming

20010087134 NASA Ames Research Center, Moffett Field, CA USA

Applications of Parallel Process HiMAP for Large Scale Multidisciplinary Problems

Guruswamy, Guru P., NASA Ames Research Center, USA; Potsdam, Mark, NASA Ames Research Center, USA; Rodriguez, David, NASA Ames Research Center, USA; Oct. 13, 2000; 32p; In English; Supercomputing 2000, Nov. 2000, Dallas, TX, USA Contract(s)/Grant(s): RTOP 509-10-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

HiMAP is a three level parallel middleware that can be interfaced to a large scale global design environment for code independent, multidisciplinary analysis using high fidelity equations. Aerospace technology needs are rapidly changing. Computational tools compatible with the requirements of national programs such as space transportation are needed.

Conventional computation tools are inadequate for modern aerospace design needs. Advanced, modular computational tools are needed, such as those that incorporate the technology of massively parallel processors (MPP).

CASI

Massively Parallel Processors; Software Development Tools; Computer Design

20010087659 NASA Ames Research Center, Moffett Field, CA USA

Code IN Exhibits - Supercomputing 2000

Yarrow, Maurice, NASA Ames Research Center, USA; McCann, Karen M., NASA Ames Research Center, USA; Biswas, Rupak, NASA Ames Research Center, USA; VanderWijngaart, Rob F., NASA Ames Research Center, USA; Oct. 26, 2000; 7p; In English; SC2000 Conference, 6-9 Nov. 2000, Dallas, TX, USA

Contract(s)/Grant(s): RTOP 725-10-31; RTOP 725-10-11; RTOP 704-40-12; RTOP 704-40-42; RTOP 704-40-52; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The creation of parameter study suites has recently become a more challenging problem as the parameter studies have become multi-tiered and the computational environment has become a supercomputer grid. The parameter spaces are vast, the individual problem sizes are getting larger, and researchers are seeking to combine several successive stages of parameterization and computation. Simultaneously, grid-based computing offers immense resource opportunities but at the expense of great difficulty of use. We present ILab, an advanced graphical user interface approach to this problem. Our novel strategy stresses intuitive visual design tools for parameter study creation and complex process specification, and also offers programming-free access to grid-based supercomputer resources and process automation.

Author

Supercomputers; Graphical User Interface; Parallel Computers

20010087678 Los Alamos National Lab., NM USA

3-D Unstructured Hexahedral-Mesh Sn Transport Methods

Morel, J. E.; McGhee, J. M.; Pautz, S. D.; Wareing, T. A.; December 2000; 12p; In English

Report No.(s): DE2001-768173; LA-UR-00-3976; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This is the final report of a three-year, Laboratory-Directed Research and Development (LDRD) project at the Los Alamos National Laboratory (LANL). We have developed a method for solving the neutral-particle transport equation on 3-D unstructured hexahedral meshes using a S, discretization in angle in conjunction with a discontinuous finite-element discretization in space and a multigroup discretization in energy. Previous methods for solving this equation in 3-D have been limited to rectangular meshes. The unstructured-mesh method that we have developed is far more efficient for solving problems with complex 3-D geometric features than rectangular-mesh methods. In spite of having to make several compromises in our spatial discretization technique and our iterative solution technique, our method has been found to be both accurate and efficient for a broad class of problems.

NTIS

Unstructured Grids (Mathematics); Grid Generation (Mathematics)

20010088129 Research Inst. for Advanced Computer Science, Moffett Field, CA USA

Redirecting by Injector

Filman, Robert E., Research Inst. for Advanced Computer Science, USA; Lee, Diana D., Science Applications International Corp., USA; [2000]; 8p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We describe the Object Infrastructure Framework, a system that seeks to simplify the creation of distributed applications by injecting behavior on the communication paths between components. We touch on some of the ilities and services that can be achieved with injector technology, and then focus on the uses of redirecting injectors, injectors that take requests directed at a particular server and generate requests directed at others. We close by noting that OIF is an Aspect-Oriented Programming system, and comparing OIF to related work.

Author

Injectors; Computer Programs

20010088238 Research Inst. for Advanced Computer Science, Moffett Field, CA USA

Applying Aspect-Oriented Programming to Intelligent Synthesis

Filman, Robert E., Research Inst. for Advanced Computer Science, USA; Apr. 01, 2000; 6p; In English; Workshop on Aspects and Dimensions of Concerns, Jun. 2000, Cannes, Cannes, France, France; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

I discuss a component-centered, aspect-oriented system, the Object Infrastructure Framework (OIF), NASA's initiative on Intelligent Synthesis Environments (ISE), and the application of OIF to the architecture of ISE.

Author

Object-Oriented Programming; Systems Engineering; Network Synthesis

20010089136 NASA Dryden Flight Research Center, Edwards, CA USA

User's Guide for Computer Program that Routes Signal Traces

Hedgley, David R., Jr., NASA Dryden Flight Research Center, USA; December 2000; 67p; In English

Contract(s)/Grant(s): RTOP 529-50-04

Report No.(s): NASA/TM-2000-209036; NAS 1.15:209036; H-2376; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This disk contains both a FORTRAN computer program and the corresponding user's guide that facilitates both its incorporation into your system and its utility. The computer program represents an efficient algorithm that routes signal traces on layers of a printed circuit with both through-pins and surface mounts. The computer program included is an implementation of the ideas presented in the theoretical paper titled "A Formal Algorithm for Routing Signal Traces on a Printed Circuit Board", NASA TP-3639 published in 1996. The computer program in the "connects" file can be read with a FORTRAN compiler and readily integrated into software unique to each particular environment where it might be used.

Author

Computer Programs; Printed Circuits; Artificial Intelligence; Algorithms

20010089253 Naval Research Lab., Washington, DC USA

The Efficiency of Various Computers and Optimizations in Performing Finite Element Computations

Marcus, Martin H., Naval Research Lab., USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

With the advent of computers with many processors, it becomes unclear how to best exploit this advantage. For example, matrices can be inverted by applying several processors to each vector operation, or one processor can be applied to each matrix. The former approach has diminishing returns beyond a handful of processors, but how many processors depends on the computer architecture. Applying one processor to each matrix is feasible with enough ram memory and scratch disk space, but the speed at which this is done is found to vary by a factor of three depending on how it is done. The cost of the computer must also be taken into account. A computer with many processors and fast interprocessor communication is much more expensive than the same computer and processors with slow interprocessor communication. Consequently, for problems that require several matrices to be inverted, the best speed per dollar for computers is found to be several small workstations that are networked together, such as in a Beowulf cluster. Since these machines typically have two processors per node, each matrix is most efficiently inverted with no more than two processors assigned to it.

Author

Computers; Optimization; Central Processing Units

20010089344 Defence Science and Technology Organisation, Information Technology Div., Salisbury, Australia

Experiences in the Development of EXC3ITE-Based HLA-Compliant Simulation Capabilities

Davies, Mike, Defence Science and Technology Organisation, Australia; Gabrisch, Carsten, Defence Science and Technology Organisation, Australia; Matthews, Karyn, Defence Science and Technology Organisation, Australia; Dunn, John M., Defence Science and Technology Organisation, Australia; May 2001; 82p; In English

Report No.(s): DSTO-TR-1147; DODA-AR-011-860; Copyright; Avail: Issuing Activity

Program Takari's Experimental Command, Control, Communication, and Intelligence (C3I) Technology Environment (EXC3ITE) will be key to the establishment of modelling and simulation architectures, practices and capabilities that are integrated with real C3I systems to support a range of military experimentation. The US High Level Architecture (HLA) is one component of an emerging encapsulation and architectural standard for simulation that has been mandated within the US Department of Defense. EXC3ITE and the HLA share two main principles of interoperability and reuse; they are both middleware rich. This commonality needs to be exploited in order to make best use of the HLA standard. EXC3ITE-based HLA-compliant simulation capabilities were recently developed employing a combination of Adacel Technologies and Aspect Computing staff. This report describes the capabilities developed and experiences gained and raises issues and recommendations on the way ahead for EXC3ITE-based simulation and synthetic environments.

Author

Environment Simulation; Environment Simulators; Distributed Interactive Simulation; Mathematical Models; Architecture

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see 82 Documentation and Information Science. For computer systems applied to specific applications, see the associated category.

20010083994 Information Assurance Technology Analysis Center, Falls Church, VA USA

The Multilayer Firewall

Humenn, Polar; Nessett, Dan; Jan. 01, 1998; 16p; In English

Report No.(s): AD-A390678; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We present a new security technology called the Multilayer Firewall. We argue that it is useful in some situations for which other approaches, such as cryptographically protected communications, present operational or economic difficulties. In other circumstances a Multilayer Firewall can compliment such security technology by providing additional protection against intruder attacks. We first present the operational theory behind the Multilayer Firewall and then describe a prototype that we designed and implemented.

DTIC

Protection; Information Systems; Computer Information Security

20010084180 NASA Ames Research Center, Moffett Field, CA USA

An Open Source Web Map Server Implementation For California and the Digital Earth: Lessons Learned

Sullivan, D. V., NASA Ames Research Center, USA; Sheffner, E. J., NASA Ames Research Center, USA; Skiles, J. W., NASA Ames Research Center, USA; Brass, J. A., NASA Ames Research Center, USA; Jun. 10, 2000; 1p; In English; AGU-GIS Symposium, 10-11 Nov. 2000, Washington, DC, USA

Contract(s)/Grant(s): NAS2-97068; NCC2-1029; RTOP 622-07-04-10; No Copyright; Avail: Issuing Activity; Abstract Only

This paper describes an Open Source implementation of the Open GIS Consortium's Web Map interface. It is based on the very popular Apache WWW Server, the Sun Microsystems Java Servlet Development Kit, and a C language shared library interface to a spatial datastore. This server was initially written as a proof of concept, to support a National Aeronautics and Space Administration (NASA) Digital Earth test bed demonstration. It will also find use in the California Land Science Information Partnership (CaLSIP), a joint program between NASA and the state of California. At least one WebMap enabled server will be installed in every one of the state's 58 counties. This server will form a basis for a simple, easily maintained installation for those entities that do not yet require one of the larger, more expensive, commercial offerings.

Author

C (Programming Language); World Wide Web; Organizations

20010084636 Naval Postgraduate School, Monterey, CA USA

Web-Based Network Management Configuration for the Indonesian Eastern Fleet Wide Area Network

Sipahutar, Halomoan; Mar. 2001; 203p; In English

Report No.(s): AD-A390446; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This thesis presents a model of an integrated wide area network using web-based network management to support fleet operations of the Indonesian Eastern Fleet. It surveys possibilities for improving the Indonesian Eastern Fleet's computer communications network systems to provide a fast, reliable, and effective way of gathering and distributing information to all fleet units. A standardized LAN infrastructure and the use of an appropriate network hardware and software was recommended to achieve connectivity of all main naval base LANs in an integrated WAN. This thesis provides a design of the Indonesian Eastern Fleet WAN that was tested using a leading edge simulation tool, EXTENDv4. A feasible sized WAN communication architecture was modeled utilizing scaling techniques, which simulated the operation of the Indonesian Eastern Fleet WAN that linked six Fast Ethernet LANs configuration in a one worksheet PC wide screen. A reliable wide area network design using ISDN 128 Kbps and T1 line 1.544 Mbps has been proved in this thesis by executing tests and simulation runs using EXTENDv4 software simulation program.

DTIC

Computer Programs; Wide Area Networks; Software Engineering

20010084734 RECOM Technologies, Inc., Moffett Field, CA USA

Performance Measurement, Visualization and Modeling of Parallel and Distributed Programs

Yan, Jerry C., RECOM Technologies, Inc., USA; Sarukkai, Sekhar R., RECOM Technologies, Inc., USA; Mehra, Pankaj, RECOM Technologies, Inc., USA; [1994]; 1p; In English

Contract(s)/Grant(s): RTOP 509-10-31; No Copyright; Avail: Issuing Activity; Abstract Only

This paper presents a methodology for debugging the performance of message-passing programs on both tightly coupled and loosely coupled distributed-memory machines. The AIMS (Automated Instrumentation and Monitoring System) toolkit, a suite of software tools for measurement and analysis of performance, is introduced and its application illustrated using several benchmark programs drawn from the field of computational fluid dynamics. AIMS includes (i) Xinstrument, a powerful source-code instrumentor, which supports both FORTRAN77 and C as well as a number of different message-passing libraries including Intel's NX Thinking Machines' CMMD, and PVM; (ii) Monitor, a library of timestamping and trace -collection routines that run on supercomputers (such as Intel's iPSC/860, Delta, and Paragon and Thinking Machines' CM5) as well as on networks of workstations (including Convex Cluster and SparcStations connected by a LAN); (iii) Visualization Kernel, a trace-animation facility that supports source-code clickback, simultaneous visualization of computation and communication patterns, as well as analysis of data movements; (iv) Statistics Kernel, an advanced profiling facility, that associates a variety of performance data with various syntactic components of a parallel program; (v) Index Kernel, a diagnostic tool that helps pinpoint performance bottlenecks through the use of abstract indices; (vi) Modeling Kernel, a facility for automated modeling of message-passing programs that supports both simulation -based and analytical approaches to performance prediction and scalability analysis; (vii) Intrusion Compensator, a utility for recovering true performance from observed performance by removing the overheads of monitoring and their effects on the communication pattern of the program; and (viii) Compatibility Tools, that convert AIMS-generated traces into formats used by other performance-visualization tools, such as ParaGraph, Pablo, and certain AVS/Explorer modules.

Author

Program Verification (Computers); Distributed Memory; Parallel Programming; Computational Fluid Dynamics; Format; Supercomputers; Software Development Tools

20010084907 Morgan State Univ., Dept. of Computer Science, Baltimore, MD USA

Morgan State University Network Resources and Training Sites

Lupton, William, Morgan State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 93-94; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The Morgan State University NRTS is an innovative NASA MU-SPIN sponsored program, for developing and sustaining infrastructure and connectivity at under-represented institutions. The program is designed, to stimulate the use of the Internet via computer networks. As an integral part of minority institutions' interdisciplinary research and education experience. Administered by the Morgan Network Resource Training Site (NRTS), participating schools have come from no access (in many cases) to completely functioning multimedia laboratories enhancing SEM studies and participating in nationwide NASA programs. A vigorous training component to ensure both its continuance and growth is included for all partnership schools and satellites. The Morgan NRTS is responsible for building and maintaining internet connectivity to minority institutions and predominately minority attended elementary and secondary schools, in the Baltimore City public school system, and providing training in network implementation, operation and usage to faculty, staff and students at these institutions. As we advance through the fourth year, the NRTS initiative thrust is to incorporate the use of the infrastructure to embrace other NASA interest programs. to utilize the capability that now exists in the participating schools to best advantage in as many outreach programs as practical in support of science, engineering and math. The collaboration with ACE program, AI J. Bra interactive educational tool, 3-t mentor program and the Earth cam project are such examples. The fourth year will see the completion phase of all participating school laboratories, increase training on site and expanded outreach involvement.

Author

Education; Schools; Students; NASA Programs; Computer Networks

20010084918 Virginia State Univ., Information Systems and Decision Sciences, Petersburg, VA USA

Problems, Prospects and Promise of Implementing Computer-Mediated Networks: The Case for Effective Participation of Minority Institutions in NASA Science and Technology Programs

Adekoya, Adeyemi, Virginia State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 153; In English; See also 20010084895; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Topics discussed include: (1) Summary Slide; (2) Current Higher Education Issues; (3) Peculiar Problems Encountered by Minority Colleges and Universities in Implementing Information Technology (IT); (4) The need for Minority Colleges and Universities to Achieve Information Access.

Derived from text

Education; Information Systems; Research and Development; Technologies

20010084919 Norfolk State Univ., Dept. of Computer Science, VA USA

The Next Generation Web Servers

Kung, Mou-Liang, Norfolk State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 155-156; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Web servers traditionally were used for publishing documents on the Internet. Most web documents are coded in HTML (the HyperText Markup Language). HTML defines "tags" which mark the text format and rendering instruction instead of document structures (e.g. authors, version, abstract, chapters, sections, ... etc). Web browser vendors obligingly implement the rendition of the HTML tags by hard-coding them into their HTML browsers, making them very hard to add new tags without sacrificing interoperability. Vendor-added tags are typical problems for interoperability. There is simply no extensibility to HTML at all. Therefore, tricks and work-arounds have been conceived to enhance web pages by adding Java applets and client-side scripts (e.g. VBScript, JavaScript, ...etc.) making these web pages dependent upon specific programming languages. At the same time, more and more businesses are opening accesses to their corporate databases via web servers to conduct e-commerce (e.g., Internet advertising, Internet purchases). When it comes to business to business data exchange, a major problem arises. Since HTML is only a presentation language, not a structural one, businesses who wish to conduct business data exchange must open two browser windows and manually transcribe or copy-and-paste data from one web page to another to achieve data exchange. Manual operations are time-consuming and prone to errors. They are totally unsuitable for financial transactions or database information exchange. Therefore, HTML is inadequate to foster process automation. Hence, new generations of web servers are needed to escape the shortcomings of HTML while remaining backward compatible to legacy HTML documents.

Derived from text

Applications Programs (Computers); Java (Programming Language); Electronic Commerce; Document Markup Languages; Hypertext

20010084922 Tennessee State Univ., Teaching and Learning Dept., Nashville, TN USA

Explorers of the Universe: Interactive Electronic Network

Alvarez, Marino C., Tennessee State Univ., USA; Burks, Geoffrey, Tennessee State Univ., USA; Busby, Michael R., Tennessee State Univ., USA; Cannon, Tiffani, Tennessee State Univ., USA; Sotoohi, Goli, Tennessee State Univ., USA; Wade, Montanez, Tennessee State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 167-170; In English; See also 20010084895

Contract(s)/Grant(s): NCC5-96; NGT5-40054; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

This paper details how the Interactive Electronic Network is being utilized by secondary and postsecondary students, and their teachers and professors, to facilitate learning and understanding. The Interactive Electronic Network is couched within the Explorers of the Universe web site in a restricted portion entitled Gateway.

Author

Computer Networks; Websites; Education; Multimedia; Computer Graphics

20010085341 Computer Sciences Corp., Moffett Field, CA USA

An Evaluation of Alternative Designs for a Grid Information Service

Smith, Warren, Computer Sciences Corp., USA; Waheed, Abdul, MRJ Technology Solutions, USA; Meyers, David, Sterling Software, Inc., USA; Yan, Jerry, NASA Ames Research Center, USA; [2001]; 4p; In English; 9th IEEE Symposium on High Performance Distributed Computing, 2000, USA

Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Globus information service wasn't working well. There were many updates of data from Globus daemons which saturated the single server and users couldn't retrieve information. We created a second server for NASA and Alliance. Things were great on that server, but a bit slow on the other server. We needed to know exactly how the information service was being used. What were the best servers and configurations? This viewgraph presentation gives an overview of the evaluation of

alternative designs for a Grid Information Service. Details are given on the workload characterization, methodology used, and the performance evaluation.

Derived from text

Characterization; Evaluation; Information Systems

20010085369 Defence Science and Technology Organisation, Communications Div., Salisbury, Australia

IP Convergence in Global Telecommunications: Voice Over Internet Protocol (VoIP)

Zahorujko, Ian; Reynolds, Alfred; Blair, Bill; Sep. 2000; 39p; In English

Report No.(s): AD-A392641; DSTO-TR-1039; DODA-AR-011-569; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A key application on any converged global network will be voice telephony. On an Internet Protocol (IP) network, this is given the generic title Voice over IP (VoIP). This paper examines the motivation behind VoIP and the standards being deployed in support of the application. It discusses the factors that determine the voice quality to users, and measures that can be made. The impact of VoIP on Speakeasy is given some limited consideration.

DTIC

Internets; Protocol (Computers); Convergence; Telephony

20010086423 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA

Malicious Hackers: A Framework for Analysis and Case Study

Kleen, Laura J.; Mar. 20, 2001; 221p; In English

Report No.(s): AD-A392952; AFIT/GOR/ENS/01M-09; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

Recent years have seen an increase in the number and severity of Information Operations (IO) attacks upon DoD resources. At a higher level, the US as a whole has come under cyber attack by individuals and groups seeking thrills, monetary gain, publicity for their causes, and myriad other goals. This effort develops a first cut model of individual hacker mentality that can be utilized to improve threat assessment, mitigate Information Assurance (IA) vulnerabilities, and improve risk assessment. Further, it is a first step toward automated characterization of Information Warfare (IW) attacks based upon hacker types. All hackers are not the same. In order to best deal with their actions and the intent behind their actions, one must understand who they are. Many hackers are not malicious, in that they hack for the thrill of learning and to "look around". However, others are intent upon gathering information for gain (profit or intelligence aspects), corrupting data or denying access to the system, or to see what harm they can cause. Research for this effort specifically focused on malicious hackers working for nation states, although the basic framework presented applies in part to any type of hacker. This results in advances in the way that hackers are classified and profiled, with a better understanding of their values, skills, and approaches to hacking. Responses can then be tailored to specifics of a given class of hackers. The model developed is illustrated by a case study.

DTIC

Risk; Assessments; Information Systems

20010086479 NASA Goddard Space Flight Center, Greenbelt, MD USA

An Automated Parallel Image Registration Technique Based on the Correlation of Wavelet Features

LeMoigne, Jacqueline, NASA Goddard Space Flight Center, USA; Campbell, William J., NASA Goddard Space Flight Center, USA; Crompt, Robert F.; [2001]; 42p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the increasing importance of multiple platform/multiple remote sensing missions, fast and automatic integration of digital data from disparate sources has become critical to the success of these endeavors. Our work utilizes maxima of wavelet coefficients to form the basic features of a correlation-based automatic registration algorithm. Our wavelet-based registration algorithm is tested successfully with data from the National Oceanic and Atmospheric Administration (NOAA) Advanced Very High Resolution Radiometer (AVHRR) and the LANDSAT/Thematic Mapper(TM), which differ by translation and/or rotation. by the choice of high-frequency wavelet features, this method is similar to an edge-based correlation method, but by exploiting the multi-resolution nature of a wavelet decomposition, our method achieves higher computational speeds for comparable accuracies. This algorithm has been implemented on a Single Instruction Multiple Data (SIMD) massively parallel computer, the MasPar MP-2, as well as on the Cray T3D, the Cray T3E and a Beowulf cluster of Pentium workstations.

Author

Algorithms; Image Processing; LANDSAT Satellites; Remote Sensing; Wavelet Analysis; Systems Integration; Digital Data; Pattern Registration

CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also 54 Man/System Technology and Life Support.

20010084011 National Inst. of Standards and Technology, Manufacturing Engineering Lab., Gaithersburg, MD USA

Industrial Autonomous Vehicle Project Report

Bostelman, R.; Jubert, M.; Szabo, S.; Bunch, R.; Evans, J.; Jun. 2001; 48p; In English

Report No.(s): PB2001-107586; NISTIR-6751; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents a National Institute of Standards and Technology (NIST) Intelligent Systems Division (ISD) effort to determine the status of Automatic Guided Vehicles (AGVs) in the USA. This report is intended to: (1) provide information to management for guiding future ISD and MEL projects and (2) review ISD mobility project research that was focused mainly on the industrial vehicle industry. The particular information collected parallels NIST's main mission goals, standards, and measurements, as well as ISD advanced technology strengths: sensing, modeling, and planning for autonomous vehicle navigation. The methods for determining the state of the AGV industry's measurement, standards and technology needs were as follows: (1) Search Internet, read trade-magazines, attend trade shows, and visit AGV vendors and users. (2) Develop initial list of AGV manufacturers and visit key manufacturer. Determine size, capabilities, and plant locations. Gather as much information as possible regarding current state-of-the-art in sensing, modeling, planning, and navigation. (3) Develop list of AGV end-users and visit key-users, particularly government users. Determine scenarios, needs, limitations, and desires of end-users.

NTIS

Information Management; Autonomous Navigation; Industries

20010084735 NASA Marshall Space Flight Center, Huntsville, AL USA

Closed-Loop Control System for Friction Stir Welding Retractable Pin Tool

Ding, R. Jeffrey, NASA Marshall Space Flight Center, USA; Romine, Peter L., Sverdrup Technology, Inc., USA; [2001]; 1p; In English; AeroMat Conference, 11-14 Jun. 2001, Long Beach, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA invention disclosure, NASA Case No. MFS-31413, entitled "System for Controlling the Stirring Pin of a Friction Stir Welding Apparatus", (Patent Pending) authored by Jeff Ding, Dr Peter Romine and Pete Oelgoetz, addresses the precision control of the friction stir welding process. The closed-loop control system automatically adjusts the spinning welding pin, real-time, to maintain a precise penetration ligament (i.e., distance between pin-tip and weld panel backside surface). A specific pin length can be maintained while welding constant thickness or tapered material thickness weld panels. The closed-loop control system provides operator data and information relative to the exact position of the welding pin inside the weld joint. This paper presents the closed-loop RPT control system that operates using the auto-feedback of force signals sensed by the tip and shoulder of the welding pin. Significance: The FSW process can be successfully used in a production environment only if there is a method or technique that informs the FSW operator the precise location of the welding pin inside the weld joint. This is essential for applications in aerospace, automotive, pressure vessel, commercial aircraft and other industries.

Author

Friction Welding; Feedback Control; Stirring; Control

20010085943 California Univ., Dept. of Statistics, Berkeley, CA USA

Discussion: Additive Logistic Regression

Buhlmann, Peter; Bin, Yu; Jan. 2000, pp. 377-386; In English

Contract(s)/Grant(s): DAAG55-98-1-0341

Report No.(s): AD-A390870; ARO-36606.12-MA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

No abstract.

Author

Artificial Intelligence; Exponential Functions; Ada (Programming Language)

20010086189 Sandia National Labs., Albuquerque, NM USA

Development and Application of Genetic Algorithms for Sandia's RATLER Robotic Vehicles

Barnette, D. W.; Pryor, R. J.; Feddema, J. T.; Nov. 2000; 62p; In English

Report No.(s): DE2001-769027; SAND2000-2846; No Copyright; Avail: Department of Energy Information Bridge

The emerging technical approach to deal with a challenging, possibly hostile, environment is likely to involve a large number of small, but fairly intelligent, robots. It is envisioned that these can covertly infiltrate a designated area, enter buildings, gather

appropriate information, and communicate with and learn from each other. They would also communicate with a smaller number of on-the-scene soldiers backed up by powerful off-line computers that can carry out large-scale information collection, analyses, and simulations. This report documents the effort to generate and apply a robust genetic algorithm to act as a vehicle controlling program for robotic behavior. In a typical scenario, robots are initially distributed randomly in a field and given the goal of locating the emitting source, be it sound or smell.

NTIS

Robotics; Genetic Algorithms

20010086587 Oak Ridge National Lab., TN USA

Fault Detection for Wheeled Mobile Robots with Parametric Uncertainty

Dixon, W. E.; Dawson, D. M.; 2001; 10p; In English

Report No.(s): PB2001-106591; No Copyright; Avail: National Technical Information Service (NTIS)

In this paper, we develop a new method for Wheeled Mobile Robot (WMR) fault detection. Specifically, we develop kinematic and dynamic models of the WMR in the presence of faults such as a change in the wheel radius (e.g., deformation, broken spoke, flat tire) or general kinematic disturbances that model slipping or skidding faults. Utilizing the WMR models, we employ a torque filtering technique to develop a prediction error based fault detection residual. The structure of the prediction error allows for fault detection despite parametric uncertainty in the WMR model.

NTIS

Robots; Fault Detection; Wheels; Detection; Dynamic Models

20010086961 Lebanese Univ., Faculty of Engineering, Tripoli, Lebanon

Neural Networks Control of a Magnetic Levitation System

Nasr, Chaiban, Lebanese Univ., Lebanon; Apr. 17, 2001; 22p; In English

Contract(s)/Grant(s): F61775-00-W-E068

Report No.(s): AD-A392568; EOARD-SPC-00-4068; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Lebanese University-Faculty of Engineering, Section I as follows: The purpose of the work is a simulating investigation of the use of artificial neural networks (ANN) in conjunction of proportional-integral-derivative (PID) controllers in control of non-contacting active magnetic bearings (AMB). The objective of this technique is to reduce the effect of the unbalance on the rotor displacement without the estimating perturbation. The work consists of the following: 1) application of artificial neural networks (multi-layer perceptrons) for nonlinear model of the active magnetic bearing by using the dynamic back-propagation methods for the adjustment of parameters; and 2) application of artificial neural networks in controlling closed-loop active magnetic bearing and comparison with the use of PID controllers. The obtained results should create a basis for a further research program connecting the fundamental knowledge with practical applications.

DTIC

Neural Nets; Magnetic Suspension; Magnetic Bearings; Levitation; Controllers

64

NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20010083998 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan

Effect of Aperture Size on Image Reconstruction Characteristics of Phase Conjugator via Nearly Degenerate Four-Wave Mixing

Okamoto, Atsushi, Hokkaido Univ., Japan; Mishima, Teruhito, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; February 1994; ISSN 0385-602X, No. 168, pp. 11-19; In Japanese; Copyright Waived; Avail: Issuing Activity

Image reconstruction with phase conjugation via nearly degenerate four-wave mixing is studied. An equation describing the dependence of the conjugate image location on the wavelength detuning is derived. The reconstructed images of distorted probe object are calculated. The result shows that the quality of the reconstructed images is limited by the aperture size, as well as, by the detuning.

Author

Apertures; Image Reconstruction; Degeneration; Four-Wave Mixing

20010084278 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Computation of Nonlinear Backscattering Using a High-Order Numerical Method Final Report

Fibich, G., Tel-Aviv Univ., Ramat-Aviv, Israel; Ilan, B., Tel-Aviv Univ., Ramat-Aviv, Israel; Tsynkov, S., Institute for Computer Applications in Science and Engineering, USA; July 2001; 16p; In English

Contract(s)/Grant(s): NAS1-97046; BSF-97-00127; RTOP 505-90-52-01

Report No.(s): NASA/CR-2001-211036; NAS 1.26:211036; ICASE-2001-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The nonlinear Schrodinger equation (NLS) is the standard model for propagation of intense laser beams in Kerr media. The NLS is derived from the nonlinear Helmholtz equation (NLH) by employing the paraxial approximation and neglecting the backscattered waves. In this study we use a fourth-order finite-difference method supplemented by special two-way artificial boundary conditions (ABCs) to solve the NLH as a boundary value problem. Our numerical methodology allows for a direct comparison of the NLH and NLS models and for an accurate quantitative assessment of the backscattered signal.

Author

Laser Beams; Nonlinear Equations; Schroedinger Equation; Wave Propagation; Boundary Value Problems; Finite Difference Theory; Backscattering

20010085939 Illinois Univ., Dept. of Mathematics Statistics and Computer Science, Chicago, IL USA

Simulation and Computation Research on Nonlinear Filtering Final Report, 2 Mar. 1998-1 Mar. 2001

Yau, Stephen S.; Mar. 31, 2001; 34p; In English

Contract(s)/Grant(s): DAAG55-98-1-0098

Report No.(s): AD-A392631; ARO-38170.1-MA-RIP; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have found the best solution to Duncan-Mortensen-Zakai equation for Kalman -Bucy filtering system with arbitrary initial condition. We show that this equation can be solved explicitly with an arbitrary initial condition by solving a system of ordinary differential equations and a Kolmogorov type equation. The Kolmogorov equation can be computed off time. We have given several algorithms to do parallel computation for the system of ordinary differential equations. As a result, we achieve the real-time solution to Duncan-Mortensen-Zakai equation for Yau filtering system with initial condition. Under Yau's direction, Professor Yeu-Tai Lai and his students in the Department of Electrical Engineering, National Cheng Kung University, Taiwan, has successfully implemented an ODEs solver for the Yau filtering system in hardware.

DTIC

Kalman Filters; Algorithms; Simulation; Computation

20010086965 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Aircrew Ionizing Doses from Nuclear Weapon Bursts

Garcia, Fred E., II; Mar. 2001; 139p; In English

Report No.(s): AD-A392627; AFIT/GNE/ENP/01M-02; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Total radioactive doses to aircrew members have been calculated in the past using different methods. The methodologies include smearing models, disk-tosser codes, and puff models. This study uses output data from the Hazard Prediction and Assessment Capability (HPAC) code as input into a FORTRAN program written by the author to calculate total dose to aircrew members through sky-shine and cabin ingestion. A description of the input parameters and new project setup in the Nuclear Weapon (NWP) module within HPAC is given. The various aspects of controlling the project and plotting the data are also described. This information is presented essentially as a user's guide to NWP that is focused toward the baseline case of this study. The basic theory behind nuclear bursts including discussion about particle distribution is given. The particle distributions that are used in HPAC are plotted using different lognormal parameters in order to find a best fit for the data. This information is included in order to better understand the science behind HPAC's particle size distributions. Theory of sky-shine and cabin ingestion dose is presented and a methodology to calculate total dose to aircrew members based on HPAC output data is given. The approach taken in this study is to use FORTRAN, oriented toward operational use, to extract this total dose for various altitudes, times after burst, and for different mission durations.

DTIC

Flight Crews; Nuclear Weapons; Ionizing Radiation; Radiation Dosage; Radioactivity; Radiation Hazards

20010086969 Purdue Univ., West Lafayette, IN USA

Constitutive Theories for Swelling Porous Media *Final Report, 1 May 1998 - 30 Jun. 2001*

Cushman, John H.; May 2001; 363p; In English

Contract(s)/Grant(s): DAAG55-98-1-0228

Report No.(s): AD-A392661; ARO-37641.2-EV; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The macroscopic field equations (three-scale) and constitutive equations have been developed for various types of swelling porous media. One theory is general enough to account for electron quasi-static effects such as swelling induced ionic migration (change in electrolyte) upon drying or wetting. Another can handle generalized Kelvin-Voigt viscoelastic solid phases with arbitrary order time-rate-of-change in the macro scale solid phase strain tensor. Explicit relations have been developed between the macroscopic and microscopic variables. Tools employed in this analysis are derived from rational mechanics and mathematical homogenization theory. Several fixed-grid and deforming-grid finite element solutions to the more elementary compaction and tearing problems have been developed. of particular note here is the study of the deformation of a soil under both normal load and shear stress.

DTIC

Deformation; Porosity; Porous Materials; Constitutive Equations

20010086970 California Univ., Berkeley, CA USA

Hybrids Systems: Computation and Control

DiBenedetto, Maria D., Editor; Sangiovanni-Vincentelli, Alberto, Editor; Mar. 2001; ISSN 0302-9743; 534p; In English; Proceedings of the 4th International Workshop, HSCC 2001 (Hybrid Systems: Computations and Control) held at Rome, Italy.

Contract(s)/Grant(s): N68171-01-M-5537

Report No.(s): AD-A392667; R/D-9137-MA-OB; ISBN 3-540-41866-0; No Copyright; Avail: CASI; A23, Hardcopy; A04, Microfiche

This volume contains the proceedings of the Fourth Workshop on Hybrid systems: Computation and Control (HSCC 2001) held in Rome, Italy on March 28-30, 2001. The Workshop on Hybrid Systems attracts researchers from industry and academia interested in modeling, analysis, synthesis, and implementation of dynamic and reactive systems involving both discrete (integer, logical, symbolic) and continuous behaviors. It is a forum for the discussion of the latest developments in all aspects of hybrid systems, including formal models and computational representations, algorithms and heuristics, computational tools, and new challenging applications.

DTIC

Computation; Conferences; Heuristic Methods; Computer Programs

20010088351 McGill Univ., Dept. of Mathematics and Statistics, Montreal, Quebec Canada

Use of Logarithmic Sums to Estimate Polynomials

Koosis, Paul, McGill Univ., Canada; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 409-446; In English; Copyright; Avail: Issuing Activity

Given any simple closed curve Γ with enough smoothness we take any large number, say N , of points z_n on Γ , equispaced thereon with respect to harmonic measure, seen from infinity, for the exterior of Γ . Then, if P is any polynomial of degree M is less than N , the values absolute value $P(z)$ can, for z inside Γ , be estimated in terms of the logarithmic average $(1/N) \sum_{n=1}^N \log^+ \sup_N \text{absolute value of } P(z_n)$. When M and N both tend to infinity the estimate holds uniformly for each fixed z inside Γ as long as the ratio M/N remains bounded away from 1, and that requirement cannot be lightened. The least superharmonic majorant and its properties play an important role in the proof of this result; other tools used are Jensen's formula and the Koebe $1/4$ theorem.

Author

Harmonic Functions; Logarithms; Polynomials; Complex Variables

20010088393 New Orleans Univ., Dept. of Mathematics, LA USA

Solutions of $f'' + P(z)f = 0$ That Have Almost All Real Zeros

Gundersen, Gary G., New Orleans Univ., USA; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 483-488; In English; Copyright; Avail: Issuing Activity

We show that for any given real constants a is greater than 0 and b is greater than or equal to 0, there exist certain real constants λ such that the equation $f'' + (a \exp 4 + b \exp 2 - \lambda)f = 0$ possesses a solution f that has an infinite number of real zeros and at most a finite number of nonreal zeros. When b is greater than 0, these equations are new examples

of equations of the form $f'' + P(z)f = 0$, where $P(z)$ is a polynomial, that possess exceptional solutions of this kind. When $b = 0$, these equations are earlier examples of Titchmarsh.

Author

Differential Equations; Polynomials; Complex Variables

20010088394 Cambridge Univ., Dept. of Pure Mathematics and Mathematical Statistics, Cambridge, UK

The Hyperbolic Metric of a Rectangle

Beardon, A. F., Cambridge Univ., UK; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 401-407; In English; Copyright; Avail: Issuing Activity

By using the theory of elliptic integrals we give an exact formula for the hyperbolic density of a rectangle at its center. We compare this to the hyperbolic density of an infinite strip and obtain (in this special case) a quantitative version of the Caratheodory Kernel Theorem.

Author

Rectangles; Kernel Functions; Theorems; Hyperbolic Coordinates; Elliptic Functions

20010088782 Rutgers Univ., Dept. of Mathematics, Newark, NJ USA

The Second Moment of the Symmetric Square L-Functions

Iwaniec, H., Rutgers Univ., USA; Michel, P., Montpellier-2 Univ., France; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 465-482; In English; Sponsored in part by Ambrose Monell Foundation, Hansmann Membership, Ellentuck Fund and Institut Univ. de France

Contract(s)/Grant(s): NSF DMS-98-01642; NSF DMS-97-29992; Copyright; Avail: Issuing Activity

In this paper we investigate the second power moment of symmetric square L-functions on the critical line, which are associated with primitive cusp forms. We establish an upper bound which is sharp with respect to the level.

Author

Bessel Functions; Fourier Series; Functional Analysis

20010089128 Building and Construction Research TNO, Centre for Maritime Engineering, Delft, Netherlands

Simplified Doubly Asymptotic Approximation Boundaries with Varying Boundary Element Time Constants

Fey, R. H. B., Building and Construction Research TNO, Netherlands; Julu 2001; 33p; In English; Original contains color illustrations

Contract(s)/Grant(s): A01/KM/117; TNO Proj. 006.13700/01.03

Report No.(s): TD2001-016; TNO-2001-CMC0R036; Copyright; Avail: Issuing Activity

The DAA(s2) (Doubly Asymptotic Approximation (Simplified)) boundary condition with different time constants for every boundary element has been implemented in 2DCAV. This boundary condition has been applied in an underwater shock calculation for the EUCLID RTP3.8 panel 3.3/3. The difference between responses, calculated using a DAA(s2) boundary condition with different time constants per boundary element, and responses, calculated using a DAA(s1) boundary condition with identical time constants per boundary element, is limited, but not negligible. The maximal relative deflection in the former calculation is 13% lower and the long-term vibration shows higher damping. This can be explained by the fact that the mean time constant per boundary element is higher in the former case. However, the damping clearly stays undercritical.

Author

Asymptotic Methods; Boundary Conditions; Shock Waves; Time Constant; Finite Element Method; Underwater Explosions; Shock Wave Propagation; Mechanical Shock; Shock Tests; Time Functions

20010089261 NASA Wallops Flight Center, Wallops Island, VA USA

The Use of Non-Standard Devices in Finite Element Analysis

Schur, Willi W., NASA Wallops Flight Center, USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A general mathematical description of the response behavior of thin-skin pneumatic envelopes and many other membrane and cable structures produces under-constrained systems that pose severe difficulties to analysis. These systems are mobile, and the general mathematical description exposes the mobility. Yet the response behavior of special under-constrained structures under special loadings can be accurately predicted using a constrained mathematical description. The static response behavior of systems that are infinitesimally mobile, such as a non-slack membrane subtended from a rigid or elastic boundary frame, can be easily analyzed using such general mathematical description as afforded by the non-linear, finite element method using an implicit solution scheme if the incremental uploading is guided through a suitable path. Similarly, if such structures are assembled with

structural lack of fit that provides suitable self-stress, then dynamic response behavior can be predicted by the non-linear, finite element method and an implicit solution scheme. An explicit solution scheme is available for evolution problems. Such scheme can be used via the method of dynamic relaxation to obtain the solution to a static problem. In some sense, pneumatic envelopes and many other compliant structures can be said to have destiny under a specified loading system. What that means to the analyst is that what happens on the evolution path of the solution is irrelevant as long as equilibrium is achieved at destiny under full load and that the equilibrium is stable in the vicinity of that load. The purpose of this paper is to alert practitioners to the fact that non-standard procedures in finite element analysis are useful and can be legitimate although they burden their users with the requirement to use special caution. Some interesting findings that are useful to the US Scientific Balloon Program and that could not be obtained without non-standard techniques are presented.

Author

Finite Element Method; Dynamic Response; Systems Analysis

65

STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

20010086420 Rutherford Appleton Lab., Radio Communications Research Unit, Chilton UK

Clear-Air Effects on Airborne Sensors Final Report

Levy, Mireille F.; May 29, 2001; 35p; In English; Original contains color plates

Contract(s)/Grant(s): F61775-00-W-E012

Report No.(s): AD-A392936; EOARD-SPC-00-4012; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report results from a contract tasking Council for the Central Laboratory of the Research Councils as follows: The contractor shall investigate novel approaches to using stochastic modeling to study radar propagation in the UK AWACS. Simulated data will be used to study the impact of refractive index fluctuations due to turbulence and determine if these phenomena will fill the radar holes or deepen them. The deliverables will consist of a report describing the methodology and results and is due 6 months after contract award.

DTIC

Airborne Equipment; Wave Propagation; Electromagnetic Radiation

20010088243 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA

Modeling Pressurized Water Reactor Kinetics

Harman, William H.; Mar. 2001; 137p; In English

Report No.(s): AD-A392679; AFIT/GNE/ENP/01M-03; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

A computer model of a pressurized water reactor (PWR) was developed for use as a teaching tool in graduate level nuclear reactor courses. The development, based on the diffusion equation, includes the methodology for solving the steady state spatial dependence of the neutron power output in a homogeneous right circular cylinder unreflected PWR system. This includes a two dimensional one energy group model, a three dimensional one energy group model, and a three dimensional two energy group model. to solve the homogeneous diffusion equation, a method was developed to search for criticality of the reactor based on the geometry and reactor core material composition. For the one energy group models, a perturbation technique was developed to assist the program user in modifying the macroscopic absorption coefficient to drive the reactor to criticality. For the three dimensional models, a blocked tridiagonal solver was developed to solve the numerical linear system of equations approximating the diffusion equation. The model was coded using Visual BASIC 5.0(Trademark). This provides a platform that is exportable to personal computers and allows direct linkage to Windows based programs. The code automatically charts and displays the power distribution profile using Excel(Trademark) and displays the calculated multiplication factor determining criticality.

DTIC

Pressurized Water Reactors; Kinetics; Nuclear Reactors; Computerized Simulation; Education; Numerical Analysis

20010088777 Wayne State Univ., Dept. of Mathematics, Detroit, MI USA

Statistical Techniques in Life Testing: Tests for the Validity of the Assumption That the Underlying Distribution of Life is Exponential

Epstein, Benjamin, Wayne State Univ., USA; Belmont, R. A., Wayne State Univ., USA; Apr. 02, 1959; 370p; In English

Contract(s)/Grant(s): Nonr-2163(00)

Report No.(s): PB-171580; TR-5; NR-042-018; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

In this paper we give a variety of procedures for testing, on the basis of life test data, whether there are significant departures from an exponential distribution of life. The particular procedures that one should adopt depend on the class of alternatives one is testing against. A number of the tests are based in an essential way on fundamental properties of Poisson processes. Questions involving choice of tests are considered, and a number of examples are worked out.

Author

Exponential Functions; Poisson Density Functions; Statistical Tests; Probability Density Functions; Failure Analysis; Applications of Mathematics; Life (Durability)

20010089373 Florida State Univ., Dept. of Statistics, Tallahassee, FL USA

Acquisition of Equipment for Research in Bayesian Automated Target Recognition *Final Report, 2 Mar. 1998 - 1 Mar. 2001*

Srivastava, Anuj; Sethuraman, Jayaram; Jun. 2001; 20p; In English

Contract(s)/Grant(s): DAAG55-98-1-0102

Report No.(s): AD-A392698; ARO-38110.10-MA-RIP; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The research reported here involves Bayesian ATR: development of statistical models and algorithms for statistical inference. The specific items that were covered are: (1) Statistical Models for Thermal Variation in Prediction of IR Images: We are interested in statistical tools for predicting IR images of a known target in a new, previously unobserved thermal state. This prediction is based on a partial observation of the new state and the database of previous observation. We have developed a linear regression framework for estimating the temperature field, associated with the new state, and using it for predicting IR images from arbitrary perspectives. (2) Statistical Models for Clutter: We have derived analytical forms, called Bessel forms, to model the marginal densities of the filtered images, filtered using a set of Gabor filters. These analytical forms are easy to compute and match well with the observed histograms. In addition, a closed-form expression for the $L(\sup A)^2$ metric, on the space of these densities, provides a measure of closeness between natural images, with applications in clutter classification. (3) Nonlinear filtering for Tracking of Manifold-Valued Parameters: In ATR and other signal/image processing applications, we are often interested in tracking parameters that are constrained to be manifold-valued. We have applied a sequential Monte Carlo algorithm to solve the nonlinear, non-Euclidean filtering problem on these manifolds. (4) Asymptotic Performance Analysis: Bayesian ATR corresponds to selection of hypothesis in the presence of nuisance variables. Using Laplace's approximation to integrate out the nuisance variables (pose, location, motion etc.), we have derived analytical forms for the probabilities of error in ATR. Additionally, we have quantified the relation between nuisance estimation errors and the ATR performance.

DTIC

Bayes Theorem; Target Recognition; Algorithms; Statistical Analysis; Mathematical Models

66

SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20010084449 Naval Research Lab., Washington, DC USA

An Analysis of Lift-Off in Laminar Diffusion Flames *Interim Report*

Cheatham, Sally A.; Oran, Elaine S.; Jun. 11, 2001; 28p; In English

Report No.(s): AD-A392492; NRL/MR/6410-01-8556; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A jet diffusion flame attached to a burner rim may lift off and become stabilized further downstream when the jet velocity is sufficiently increased. In turbulent jet diffusion flames, such liftoff has been described alternately as the result of a stabilized premixed flame base, and as the result of extinguished diffusion flamelets at the flame base. Laminar flames exhibit liftoff behavior as well, and possess a relatively simpler flame structure which may be studied to provide insight into the basic mechanism responsible for flame lift. In the present study, an asymptotic solution and a numerical solution of a reduced set of equations are used to study the lifted structure of a laminar diffusion flame associated with a fuel jet. The numerical model solves a temperature equation with a finite chemical reaction rate. The asymptotic analysis is based on a flame-sheet model in the limit of large activation energy and large Damkohler number. While it is likely that premixing at the flame base affects the structure of a lifted flame, the current analysis suggests that local extinction of the flame at its base is a contributing mechanism to flame lift.

DTIC

Laminar Flow; Diffusion Flames; Turbulent Jets; Premixed Flames; Jet Flow; Liftoff (Launching)

20010087432 Air Force Scientific Advisory Board, Washington, DC USA

Report on Air Force Command and Control: The Path Ahead, Volume 1, Summary. SAB-TR-00-01

December 2000; 122p; In English; Original contains color illustrations

Report No.(s): PB2001-106460; No Copyright; Avail: National Technical Information Service (NTIS)

This volume summarizes the deliberations and conclusions of the 2000 Air Force Scientific Advisory Board (SAB) Summer Study, 'Air Force Command and Control: The Path Ahead.' In this study, the Board was asked to assess the command and control system and the supporting communication and information systems; to consider technical and process improvements and to make recommendations on what should be done to 'have the Air Force linked by 2005'; and to build toward the Air Force's long-term command and control goals. There are three volumes to the report. This volume, Volume 1, presents a brief summary of the findings and the major recommendations. Volume 2 presents the panel reports, including detailed findings and recommendations. Volume 3 includes the majority of the appendices, a few being included in Volumes 1 and 2. The study results are the product of a substantial effort by a skilled team, including panels led by experts in their assigned area. The study leadership wishes to thank the many individuals and organizations in Government and industry who contributed to the deliberations and conclusions presented. In addition to SAB members, many ad hoc members devoted their time. Air Force Major Air Command liaison officers were extremely helpful in our research and deliberations, as were the technical writers provided by the Air Force Academy. In addition, both the liaison officers and the technical writers provided outstanding administrative and logistics support.

NTIS

Armed Forces (USA); Command and Control; Military Operations

20010088778 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Living with a Star Program Mission Plan

Barth, Janet, NASA Goddard Space Flight Center, USA; [2001]; 25p; In English; RADECS 2001, 13 Sep. 2001, Grenoble, France; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

LWS (Living With a Star) is research science focused to facilitate enabling science for spacecraft design (specifically environment specification models) and spacecraft operations (specifically Space Weather research). The following topics are discussed: LWS goals and program, program architecture, the solar dynamic observer, the geospace plan, the space environment testbed concept, and the heliosphere missions.

Derived from text

Operations Research; Space Weather; Space Programs; Sun; Earth (Planet); Aerospace Environments; Environment Models; Space Flight

67

THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

20010084448 Naval Research Lab., Washington, DC USA

CHEMEQ2: A Solver for the Stiff Ordinary Differential Equations of Chemical Kinetics

Mott, David R.; Oran, Elaine S.; Jul. 27, 2001; 67p; In English

Report No.(s): AD-A392490; NRL/MR/6400-01-8553; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes and documents the subroutine CHEMEQ2, used to integrate stiff ordinary differential equations arising from reaction kinetics. This is a second generation improvement of CHEMEQ using a new quasi-steady-state predictor-corrector method that is A-stable for linear equations and second-order accurate. A single integration method can now be used for all species, regardless of the timescales of the individual equations. Start-up costs and memory requirements are low, so CHEMEQ2 is ideal for multi-dimensional reacting-flow simulations which require the solution of a process-split, initial-value problem in every computational cell for every global timestep. The algorithm, its implementation, the FORTRAN code, the internal variables and the argument lists are presented, along with several test problem results.

DTIC

Differential Equations; Reacting Flow; Kinetic Equations; Chemical Reactions; Applications Programs (Computers); Boundary Value Problems; Predictor-Corrector Methods; Reaction Kinetics

20010086238 NASA Langley Research Center, Hampton, VA USA

Analysis of Preconditioning and Relaxation Operators for the Discontinuous Galerkin Method Applied to Diffusion

Atkins, H. L., NASA Langley Research Center, USA; Shu, Chi-Wang, Brown Univ., USA; [2001]; 11p; In English; 15th

Computational Fluid Dynamics Conference, 11-14 Jun 2001, Anaheim, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 01-2554; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The explicit stability constraint of the discontinuous Galerkin method applied to the diffusion operator decreases dramatically as the order of the method is increased. Block Jacobi and block Gauss-Seidel preconditioner operators are examined for their effectiveness at accelerating convergence. A Fourier analysis for methods of order 2 through 6 reveals that both preconditioner operators bound the eigenvalues of the discrete spatial operator. Additionally, in one dimension, the eigenvalues are grouped into two or three regions that are invariant with order of the method. Local relaxation methods are constructed that rapidly damp high frequencies for arbitrarily large time step.

Author

Eigenvalues; Galerkin Method; Discretization (Mathematics); Operators (Mathematics); Diffusion

20010088087 South Carolina Univ., Dept. of Mathematics and Statistics, Columbia, SC USA

A Fast PDE Solver Environment for Large-Scale Applications *Final Report, 1 Jul. 1996 - 30 Jun. 2000*

Jawerth, Bjorn; Apr. 28, 2001; 9p; In English

Contract(s)/Grant(s): DAAH04-96-1-0326

Report No.(s): AD-A390687; 13060-F195; ARO-36197.1-RT-DPS; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The major achievements of this project have been summarized in the Interim Progress Reports. The results of most significance fall in the following major categories: Quasilinear PDEs, the Eikonal Equation, and the Image Irradiance Equation; Photometric Stereo and Interactive Visual Design; Discrete Curvature; Lattice Boltzmann Simulation of Discrete Curvature Flow by Mean Curvature for computer vision and image processing; and Electromagnetic Scattering from Non-Smooth Domains and new Piecewise Polynomial Wavelet Bases.

DTIC

Partial Differential Equations; Eikonal Equation

20010088228 State Univ. of New York, Mathematics Dept., Stony Brook, NY USA

Locally Minimal Sets for Conformal Dimension

Bishop, Christopher J., State Univ. of New York, USA; Tyson, Jeremy T., State Univ. of New York, USA; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 361-373; In English

Contract(s)/Grant(s): NSF DMS-98-00924; Copyright; Avail: Issuing Activity

We show that for each 1 is less than or equal to α is less than d and K is less than infinity there is a subset X of \mathbb{R}^d such that $\dim(f(X))$ is greater than or equal to $\alpha = \dim(X)$ for every K -quasiconformal map, but such that $\dim(g(X))$ can be made as small as we wish for some quasiconformal g , i.e., the conformal dimension of X is zero. These sets are then used to construct new examples of minimal sets for conformal dimension and sets where the conformal dimension is not attained.

Author

Conformal Mapping; Minimal Surfaces; Set Theory; Metric Space

20010088229 Academy of Sciences of the Ukraine, Inst. of Mathematics, Kiev, Ukraine

Finely Holomorphic and Finely Subharmonic Functions in Contour-Solid Problems

Tamrazov, Promarz M., Academy of Sciences of the Ukraine, Ukraine; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 325-360; In English

Contract(s)/Grant(s): RSAS-1474; Copyright; Avail: Issuing Activity

We establish the purely fine contour-solid theory for finely holomorphic and finely hypoharmonic functions containing refined, strengthened and extended theorems for these classes of functions in finely open sets of the complex plane with preservable majorants (from the maximal classes of such majorants for these function classes). The work is based on various new arguments and on a new, unified approach common for finely hypoharmonic and finely holomorphic functions. We give also strengthened and extended results on cluster properties of holomorphic and finely holomorphic functions.

Author

Harmonic Functions; Analytic Functions; Contours; Functional Analysis; Theorems

20010088230 State Univ. of New York, Mathematics Dept., Stony Brook, NY USA

Matrices for Fenchel-Nielsen Coordinates

Maskit, Bernard, State Univ. of New York, USA; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN

1239-629X; Volume 26, No. 2, pp. 267-304; In English

Contract(s)/Grant(s): NSF DMS-95-00557; Copyright; Avail: Issuing Activity

We give an explicit construction of matrix generators for finitely generated Fuchsian groups, in terms of appropriately defined Fenchel-Nielsen (F-N) coordinates. The F-N coordinates are defined in terms of an F-N system on the underlying orbifold, this is an ordered maximal set of simple disjoint closed geodesics, together with an ordering of the set of complementary pairs of pants. The F-N coordinate point consists of the hyperbolic sines of both the lengths of these geodesics, and the lengths of arc defining the twists about them. The mapping from these F-N coordinates to the appropriate representation space is smooth and algebraic. We also show that the matrix generators are canonically defined, up to conjugation, by the F-N coordinates. As a corollary, we obtain that the Teichmüller modular group acts as a group of algebraic diffeomorphisms on this Fenchel-Nielsen embedding of the Teichmüller space.

Author

Riemann Manifold; Geodesic Lines; Matrices (Mathematics); Analytic Geometry; Coordinates; Coordinate Transformations

20010088350 Kazan State Univ., Chebotarev Inst. of Mathematics and Mechanics, USSR

The Integral Means Spectrum for Lacunary Series

Kayumov, I. R., Kazan State Univ., USSR; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 447-453; In English

Contract(s)/Grant(s): RFFR-99-01-00366; RFFR-99-01-00173; Copyright; Avail: Issuing Activity

Asymptotically sharp bounds for the integral means spectrum of lacunary series are proved. In particular, we show that Rohde's estimates for lacunary series with positive coefficients are sharp and hold not only for the positive case. Moreover, a relation between the law of the iterated logarithm and the integral means spectrum is established. Using this we give a sharp version of the Makarov law of the iterated logarithm for lacunary series.

Author

Logarithms; Conformal Mapping; Trigonometric Functions

20010088384 International Univ., Mathematics Dept., Qazvin, Iran (Islamic Republic of)

A Riesz Representation Formula for Super-Biharmonic Functions

Abkar, Ali, International Univ., Iran (Islamic Republic of); Hedenmalm, Hakan, Lund Univ., Sweden; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 305-324; In English; Copyright; Avail: Issuing Activity

Let u be a real-valued function defined on the unit disk D . We call u superbiharmonic provided that u is locally integrable and the bi-laplacian (Laplacian operator $(\Delta^2)u$) is a positive distribution on D . In this paper, we shall establish a representation formula for super-biharmonic functions. This formula can be regarded as an analogue of the Poisson-Jensen representation formula for subharmonic functions.

Author

Biharmonic Equations; Harmonic Functions; Riesz Theorem; Operational Calculus; Laplace Equation; Disks (Shapes)

20010088532 Rutgers Univ., Mathematics Dept., Newark, NJ USA

Polynomial Complexity of the Gilman-Maskit Discreteness Algorithm

Jiang, Yi-Cheng, Rutgers Univ., USA; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 375-390; In English; Copyright; Avail: Issuing Activity

The main result of this paper is a polynomial bound for the computational complexity of an algorithm to determine whether or not a non-elementary two-generator subgroup of $PSL(2, \mathbb{R})$ is discrete, that is, an algorithm to determine whether such a subgroup is Fuchsian. The proof that there exists such a bound uses techniques from both hyperbolic geometry and symbolic computation.

Author

Algorithms; Polynomials; Discrete Functions; Subgroups; Theorem Proving; Differential Geometry; Complex Variables

20010088781 Universidad Tecnica Federico Santa Maria, Dept. de Matematica, Valparaiso, Chile

Anticonformal Automorphisms and Schottky Coverings

Hidalgo, Ruben A., Universidad Tecnica Federico Santa Maria, Chile; Costa, Antonio F., Universidad Nacional de Educacion a Distancia, Spain; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 489-508; In English

Contract(s)/Grant(s): FONDECYT-1000715; DGICYT-PB-99-0017; Copyright; Avail: Issuing Activity

In this work, we consider anticonformal automorphisms of closed Riemann Surfaces and Schottky groups. We study the problem of deciding when an anticonformal automorphism can be lifted for some Schottky covering (Schottky type automorphisms). This can be seen as generalization of the results due to Sibner, Heltai and Natanzon on anticonformal involutions. Also, for the conformal automorphisms, we study the relation between the condition of being the square of an anticonformal automorphism and of being of Schottky type.

Author

Automorphisms; Riemann Manifold; Topology

20010088783 Jyvaskyla Univ., Dept. of Mathematics, Finland

Modulus and Continuous Capacity

Kallunki, Sari, Jyvaskyla Univ., Finland; Shanmugalingam, Nageswari, Jyvaskyla Univ., Finland; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 455-464; In English; Copyright; Avail: Issuing Activity

It is shown that if Ω is a domain in a metric measure space X such that X is proper, doubling, supports a $(1, p)$ -Poincare inequality, and is ϕ -convex, then $\text{Mod}(\text{sub } p)(E, F, \Omega)$ is equal to the locally Lipschitz p -capacity of the triple (E, F, Ω) .

Author

Metric Space; Sobolev Space; Theorems; Borel Sets

20010088784 China Univ. of Mining and Technology., Center of Mathematics, China

On Limiting Directions of Julia Sets

Qiao, Jian-Yong, China Univ. of Mining and Technology., China; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 391-399; In English; Copyright; Avail: Issuing Activity

We deal with the iteration of transcendental entire functions, and prove some properties on the Julia sets.

Author

Transcendental Functions; Iteration; Set Theory; Complex Variables

20010088841 Saarland Univ., Fachrichtung 6.1 Mathematik, Saarbruecken, Germany

Higher Order Variational Inequalities with Non-Standard Growth Conditions in Dimension Two: Plates with Obstacles

Bildhauer, Michael, Saarland Univ., Germany; Annales Academiae Scientiarum Fennicae: Mathematica; 2001; ISSN 1239-629X; Volume 26, No. 2, pp. 509-518; In English; Copyright; Avail: Issuing Activity

For a domain Ω is proper subset of \mathbb{R}^2 we consider the second order variational problem of minimizing $J(w) = \int_{\Omega} f(\exp 2 w) dx$ among functions w : Ω approaches \mathbb{R} with zero trace respecting a side condition of the form w is greater than or equal to ψ on Ω . Here f is a smooth convex integrand with non-standard growth, a typical example is given by $f(\exp 2 w) = \text{absolute value of } (\exp 2 w) \ln(1 + \text{the absolute value of } (\exp 2 w))$. We prove that-under suitable assumptions on ψ -the unique minimizer is of class $C(\sup 1, \alpha)(\Omega)$ for any α is less than 1. Our results provide a kind of interpolation between elastic and plastic plates with obstacles.

Author

Calculus of Variations; Elliptic Differential Equations; Theorems; Inequalities

70

PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see categories 71 through 77. For related instrumentation see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

20010083769 Research and Development Labs., Culver City, CA USA

USA Air Force Summer Research Program (SRP) - 1997. Summer Faculty Research Program Final Reports. Volume 4B. Rome Laboratory

Moore, Gary, Research and Development Labs., USA; December 1997; 258p; In English

Contract(s)/Grant(s): F49620-93-C-0063

Report No.(s): AD-B387341; AFRL-SR-BL-TR-00-0756; No Copyright; Avail: CASI; A03, Microfiche; A12, Hardcopy

The USA Air Force Summer Research Program (USAF-SRP) is designed to introduce university, college, and technical intitute faculty members, graduate students, and high school students to Air Force research. This is accomplished by the faculty

members (Summer Faculty Research Program, (SFRP)), graduate students (Graduate Student Research Program (GSRP), and high school students (High School Apprenticeship Program (HSAP) being selected on a nationally advertised competitive basis during the summer intersession period to perform research at Air Force Research Laboratory (AFRL) Technical Directorates, Air Force Air Logistics Centers (ALC), and other AF Laboratories. This volume consists of a program overview, program management statistics, and the final technical reports from the SFRP participants at the Rome Laboratory.

DTIC

Research and Development; Armed Forces (USA); Project Management; Education

20010084294 Princeton Univ., Plasma Physics Lab., NJ USA

Motion of Charged Particles Near Magnetic Field Discontinuities

Dodin, I. Y.; Fisch, N. J.; Nov. 2000; 22p; In English

Report No.(s): DE2001-768663; PPPL-3519; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The motion of charged particles in slowly changing magnetic fields exhibits adiabatic invariance even in the presence of abrupt magnetic discontinuities. Particles near discontinuities in magnetic fields, what we call 'boundary particles', are constrained to remain near an arbitrarily fractured boundary even as the particle drifts along the discontinuity. A new adiabatic invariant applies to the motion of these particles.

NTIS

Adiabatic Equations; Discontinuity; Magnetic Fields; Charged Particles

20010084787 National Inst. of Standards and Technology, Electronics and Electrical Engineering Lab., Boulder, CO USA

Predicted and Measured Field Strengths in the Boulder, Colorado, Area from Two Proposed Terrestrial Digital Television Tower Sites Final Report

Holloway, C. L.; Sanders, F. H.; McKenna, P. M.; May 2001; 49p; In English

Report No.(s): PB2001-107908; NIST/TN-1519; NTIA-01-387; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report, we have analyzed the expected electric (E) field strengths in the Boulder area from two proposed terrestrial DTV transmitter locations, the Eldorado Mountain site and the Squaw Mountain site. The Eldorado Mountain and Squaw Mountain sites were selected from the set of candidate sites because these two possible sites bound the propagation environment that would occur at both the Table Mountain National Radio Quiet Zone (NRQZ) and the Department of Commerce (DOC) Laboratories in Boulder. The Eldorado Mountain site affords substantial line-of-sight coverage over the Boulder area, while the Squaw Mountain site affords only indirect (diffractive) coverage over the same area. The other possible tower sites fall between these two types of propagation conditions. The goals of this work were to determine the expected E-field strengths at the Table Mountain NRQZ located north of Boulder, Colorado and at the DOC Laboratories located at 325 Broadway in Boulder, Colorado. This study also assessed the potential impacts of the proposed sites on a broad range of Federal Government research and metrology programs that depend upon a relatively quiet radio-frequency electromagnetic environment. The DOC conducted tests and analyses to assess whether E-field strengths produced by the DTV transmissions from either proposed site could meet the FCC's regulatory limits for the Table Mountain NRQZ. In addition, tests and analyses were performed to ascertain the impact of DTV transmissions from either proposed site on measurement efforts that are performed on a regular basis at the DOC Laboratories. In this study, measured and predicted E-field strengths are used to estimate the E-field strengths in the Boulder area for the proposed transmitter antenna heights of two possible transmitter locations, Eldorado Mountain and Squaw Mountain. With these predictions, we were able to determine the E-field strengths at both the DOC Laboratories and at the Table Mountain NRQZ.

NTIS

Transmitters; Towers; Electric Fields; Field Strength; Digital Television

20010085332 Lawrence Livermore National Lab., Livermore, CA USA

Ballistic Experiments with Titanium and Aluminum Targets Final Report

Gogolowski, Raymond P.; Morgan, Bruce R.; Apr. 2001; 23p; In English

Contract(s)/Grant(s): DTFA03-97-Z-90007

Report No.(s): AD-A392836; DOT/FAA/AR-01/21; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report describes experiments in penetration mechanics on 6A1-4V titanium and 2024-T3 aluminum. This work was accomplished by the Lawrence Livermore National Laboratory (LLNL) at the LLNL Terminal Ballistics Laboratory of the Physics Directorate under an Interagency Agreement between the Federal Aviation Administration (FAA) William J. Hughes Technical Center and the Department of Energy (DOE). The work was accomplished under the FAA's Aircraft Catastrophic Failure Prevention Program as part of its research into the turbine engine uncontainment event. The object of the experiments was to determine the ballistic speed limit of 6A1-4V alloy titanium and 2024-T3 alloy aluminum and the failure modes of the

projectiles and targets. Data was obtained for both materials using various thickness plates of the test materials to simulate aircraft skins and various size and shape 6A1-4V alloy titanium projectiles. The results of this experimental work will be used to help define the type of material failures in material models of the DYNA3D finite element code, which are being developed/validated for evaluating aircraft/engine designs relative to the federal airworthiness standards and for improving mitigation/containment technology.

DTIC

Terminal Ballistics; Titanium; Aluminum; Titanium Alloys; Aluminum Alloys; Failure Modes; Penetration

20010086963 Mitre Corp., McLean, VA USA

Moletronics II

Lewis, Nathan; Williams, Ellen; Alivisatos, Paul; Block, Steven; Dally, William; Jun. 2001; 71p; In English; Original contains color plates

Report No.(s): AD-A392604; JSR-00-120; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Molecular Electronics and Quantum Computing present very different challenges in the development of their potential for future information technology. In Molecular Electronics, the challenges revolve around effectively dealing with the potential for a very high density of devices. In Quantum Computing, a fairly small number of actual devices (bits) is needed, but the technical challenges of creating and controlling those devices are extreme.

DTIC

Molecular Electronics; Quantum Computation; Quantum Theory

20010087779 Los Alamos National Lab., NM USA

Imaging Time-of-Flight Ion Mass Spectrograph

Funsten, H. O.; McComas, D. J.; 2001; 16p; In English

Report No.(s): DE2001-768176; LA-UR-00-3858; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This is the final report of a three-year, Laboratory-Directed Research and Development (LDRD) project at the Los Alamos National Laboratory (LANL). The primary objective of this project was to develop and demonstrate a new type of time-of-flight mass spectrometer having a duty cycle of unity, which is a factor of 10^3 - 10^4 better than conventional time-of-flight spectrometers. The spectrometer concept was demonstrated, and an additional pre-filtration technique was developed and demonstrated. The two techniques are patents pending.

NTIS

Time of Flight Spectrometers; Imaging Techniques; Spectrographs; Mass Spectrometers

20010088234 Los Alamos National Lab., NM USA

Status Report on the Low-Energy Demonstration Accelerator (LEDA)

Smith, H. V.; Schneider, J. D.; 2001; 10p; In English

Report No.(s): DE2001-768182; LA-UR-00-3788; No Copyright; Avail: Department of Energy Information Bridge

The 75-keV injector and 6.7-MeV RFQ that comprise the first portion of the cw, 100-mA proton Linac for the accelerator production of tritium (APT) project have been built and tested. The LEDA RFQ has been extensively tested for pulsed and cw output-beam currents is less than 100-mA. A follow-on experiment to intentionally introduce and measure beam halo on the RFQ output beam, is now being installed.

NTIS

Linear Accelerators; Injectors

71 ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see 45 Environment Pollution. For aircraft noise see also 02 Aerodynamics and 07 Aircraft Propulsion Propulsion and Power.

20010084632 NASA Ames Research Center, Moffett Field, CA USA

Kepler Mission: End-to-End System Demonstration

Borucki, William, NASA Ames Research Center, USA; Koch, D., NASA Ames Research Center, USA; Dunham, E., NASA Ames Research Center, USA; Jenkins, J., NASA Ames Research Center, USA; Witteborn, F., NASA Ames Research Center, USA; Updike, T., NASA Ames Research Center, USA; [2000]; 1p; In English; International Astronomical Union Meeting, 4-13

Aug. 2000, Manchester, UK

Contract(s)/Grant(s): RTOP 344-37-00-03; No Copyright; Avail: Issuing Activity; Abstract Only

A test facility has been constructed to demonstrate the capability of differential ensemble photometry to detect transits of Earth-size planets orbiting solar-like stars. The main objective is to determine the effects of various noise sources on the capability of a CCD photometer to maintain a system relative precision of 1×10^{-5} for $m_v = 12$ stars in the presence of system-induced noise sources. The facility includes a simulated star field, fast optics to simulate the telescope, a thinned back-illuminated CCD similar to those to be used on the spacecraft and computers to perform the onboard control, data processing and extraction. The test structure is thermally and mechanically isolated so that each source of noise can be introduced in a controlled fashion and evaluated for its contribution to the total noise budget. The effects of pointing errors or a changing thermal environment are imposed by piezo-electric devices. Transits are injected by heating small wires crossing apertures in the star plate. Signals as small as those from terrestrial-size transits of solar-like stars are introduced to demonstrate that such planets can be detected under realistic noise conditions. Examples of imposing several noise sources and the resulting detectabilities are presented. These show that a differential ensemble photometric approach CCD photometer can readily detect signals associated with Earth-size transits.

Author

Charge Coupled Devices; Test Facilities; Noise Measurement; Onboard Data Processing

20010084650 NASA Langley Research Center, Hampton, VA USA

Investigation of Blade Impulsive Noise on a Scaled Fully Articulated Rotor System

Scheiman, James, NASA Langley Research Center, USA; Hoad, Danny R., Army Air Mobility Research and Development Lab., USA; June 1977; 46p; In English

Contract(s)/Grant(s): RTOP 505-10-26-03; DA Proj. 1F1-61102-AH45

Report No.(s): NASA-TM-X-3528; NAS 1.15:X-3528; L-11229; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Helicopter impulsive noise tests were conducted in the Langley V/STOL tunnel with an articulated rotor system. The tests demonstrated that impulsive noise could be simulated for low-speed forward flight with low descent rates and also in the high-speed level flight. For the low forward speed condition, the noise level was highly sensitive to small changes in descent rate. For the high-speed condition, the noise level was increased with an increase in rotor thrust.

Author

Helicopters; Blade Slap Noise; Horizontal Flight; Noise Intensity; Rotors; Acoustics

20010084717 Department of the Navy, Washington, DC USA

Method for Generating 2 and 3-Dimensional Fluid Meshes for Structural/Acoustic Finite Element Analysis in Infinite Medium

Reise, Christa M., Inventor; Aug. 07, 2000; 18p; In English

Patent Info.: Filed 7 Aug. 2000; US-Patent-Appl-SN-09,632,002

Report No.(s): AD-D019931; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The present invention relates to a method for generating 2 and 3-dimensional fluid meshes for structural/acoustic finite element analysis in an infinite medium. The method broadly comprises the steps of: (1) enclosing a structure to be analyzed in a block of fluid; (2) determining a bias factor and coordinates for the mesh; and (3) generating at least one of a two dimensional and a three dimensional mesh using the coordinates and the bias factor.

DTIC

Finite Element Method; Acoustic Measurement; Computational Grids; Grid Generation (Mathematics)

20010084782 National Defence Research Establishment, Stockholm, Sweden

Stable PE Model for Wave Propagation in Fluid-Solid Media *En Stabil PE-Modell foer Vagutbredning i Fluida-Solida Media*

Sundstroem, A.; Dec. 2000; ISSN 1104-9154; 30p; In English

Report No.(s): PB2001-107289; FOA-00-01741-409-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Previously, a fluid PE model called JEPE was designed, programmed and tested for numerical prediction of sound propagation in shallow water areas with range-dependent geometry and medium parameters. The results were quite satisfactory, and the model was used also for inverse problems, to estimate medium parameters from measured sound propagation data. Soon, an extension to cover situations with a layered, solid seabed was found desirable. In this report, the basic steps in the design of

such a model are described, both for a range-independent stratification of the seabed and for the range-dependent case. The code produced for this model was called JEPE-S and is presented in a separate FOA report by Brodd Leif Anderson.

NTIS

Wave Propagation; Acoustics; Ocean Bottom; Mathematical Models; Wave Equations; Sound Propagation

20010085816 Hoover and Keith, Inc., USA

Industrial Hygiene Breakout Session Noise Control

Keith, Reginald, Hoover and Keith, Inc., USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 103; In English; See also 20010085800; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Mr. Reginald Keith, a principal with Hoover & Keith, Inc. has been engaged in noise and vibration control design for over 20 years. A great deal of his experience has been in the power, pipeline, petrochemical and HVAC industries. Mr. Keith has also provided professional services to the NASA Glenn Research Center (GRC) and helped the Industrial Hygiene professionals there to produce a noise demonstration CD that is used in training. Mr. Keith is a graduate of the University of Texas with a Masters Degree in Engineering and is a registered professional engineer in Texas and Oregon with a specialty in acoustics. During the Industrial Hygiene breakout session Mr. Keith provided a three-hour presentation on industrial noise and noise control methodologies. The presentation included an introduction and review of sound terminologies and measurement techniques then touched on the subject of room acoustics and indoor sound distribution and transmission loss. Mr. Keith provided many examples and photographs of projects illustrating control measures utilized in real life industrial and manufacturing environments. Project examples included Heating, Ventilation, and Air Conditioning equipment, pumps, motors, fans, engines and other power generating equipment, as well as metalworking and other industrial process equipment. Included in the project summaries were alternate options considered, net effectiveness of the control measure implemented and the approximate cost. Control methods included full and partial enclosure, mufflers, various sound absorbing materials, vibration dampening and isolation, and noise cancellation. Discussed briefly was the topic of outdoor sound propagation and community noise issues. Included in the discussion was the effect of distance, atmospherics, barriers, and trees on outdoor sound transmission.

Author

Noise (Sound); Noise Pollution; Noise Reduction; Sound Propagation; Sound Transmission

20010085941 Defence Science and Technology Organisation, Melbourne Australia

Instruction Manual for Ultrasonic Noise Recording System

Readhead, Mark L.; Apr. 2001; 23p; In English

Report No.(s): AD-A392636; DSTO-GD-0285; DODA-AR-011-857; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A portable system for recording ambient noise in the sea has been developed. It is suitable for ultrasonic frequencies and can digitize up to a rate of 1 MHz. The hydrophone is attached to the end of a light weight aluminium pole of 4.5 m extension, which can be dismantled into 1.5 m lengths for ease of transport. The hydrophone has an integral preamplifier which is powered by batteries. The analogue to digital conversion is performed in a box with similar dimensions to a lap top computer. It is powered by another similarly-sized box of rechargeable batteries. The process is controlled by and the data is stored on a lap top computer. Software has been written to display the spectra of the ambient noise. Instructions on the use of the hardware and software are provided.

DTIC

Manuals; Noise (Sound); Hydrophones; Computers; Computer Programs; Recording Instruments

20010086966 Louisville Univ. Foundation, Inc., KY USA

Procathepsin D Stimulation of Human Breast Cancer Cell Growth Annual Report, 15 Jun. 2000 - 14 Jun. 2001

Vatvicka, Vaclav; Jul. 2001; 11p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-99-1-9257

Report No.(s): AD-A392652; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The long-term goal is to develop a new breast cancer treatment based on inhibition of the growth factor activity of procathepsin D. During the current year we tested all possible breast cancer cell lines for secretion of procathepsin D. Based on our data, we prepared numerous clones of MDA-MB-231 cells transfected with all expected vectors. Both the secretion of procathepsin D in vitro and growth activity in vivo of these clones has been established. A library of 10 synthetic peptides with a single substitution of one amino acid have been prepared and tested. Based on this information we know the exact binding moiety

on the molecule of activation peptide. We also prepared monoclonal antibodies against these peptides and tested them as potential inhibitors of breast cancer cell growth.

DTIC

Mammary Glands; Cancer; Cell Division; Inhibitors

20010089336 Lockheed Martin Corp., Hampton, VA USA

Experimental Structural Dynamic Response of Plate Specimens Due to Sonic Loads in a Progressive Wave Tube

Betts, Juan F., Lockheed Martin Corp., USA; August 2001; 97p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS1-00135; RTOP 706-63-71-81

Report No.(s): NASA/CR-2001-211045; NAS 1.26:211045; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The objective of the current study was to assess the repeatability of experiments at NASA Langley's Thermal Acoustic Fatigue Apparatus (TAFA) facility and to use these experiments to validate numerical models. Experiments show that power spectral density (PSD) curves were repeatable except at the resonant frequencies, which tended to vary between 5 Hz to 15 Hz. Results show that the thinner specimen had more variability in the resonant frequency location than the thicker sample, especially for modes higher than the first mode in the frequency range. Root Mean Square (RMS) tended to be more repeatable. The RMS behaved linearly through the SPL range of 135 to 153 dB. Standard Deviations (STDs) of the results tended to be relatively low constant up to about 147 dB. The RMS results were more repeatable than the PDS results. The STD results were less than 10% of the RMS results for both the 0.125 in (0.318 cm) and 0.062 in (0.1588 cm) thick plate. The STD of the PSD results were around 20% to 100% of the mean PSD results for non-resonant and resonant frequencies, respectively, for the 0.125 in (0.318 cm) thicker plate and between 25% to 125% of the mean PSD results, for nonresonant and resonant frequencies, respectively, for the thinner plate.

Author

Dynamic Response; Resonant Frequencies; Dynamic Structural Analysis; Power Spectra

20010089343 Defence Science and Technology Organisation, Maritime Operations Div., Fishermans Bend, Australia

A Parameter-Insensitive False Alarm Rate Detection Processor

Drumheller, David M., Defence Science and Technology Organisation, Australia; Lew, Henry, Defence Science and Technology Organisation, Australia; June 2001; 32p; In English

Report No.(s): DSTO-TR-1153; DODA-AR-011-869; Copyright; Avail: Issuing Activity

In active sonar systems, detection is the process of deciding if a target echo is present in a return. This is often accomplished by an operator who examines the sonar receiver output and decides if any portion of it is larger than the expected response due to reverberation. Detection may also be accomplished automatically using a processor that sets a threshold based on a sampling of the receiver output. In this report, a detection processor developed under the task NAV 99/027 is presented for use in active sonar systems that process returns incoherently. The statistics of the receiver output of such a system follows the two-parameter gamma probability density function (PDF). Consequently, the detection processor computes the detection threshold as a non-linear function of the ratio of two ranked values of the receiver output. The result is a detection processor that exhibits a false alarm probability that is bounded within ten percent of a design value regardless of the values of the gamma PDF parameters.

Author

False Alarms; Receivers; Sonar; Echo Sounding; Probability Density Functions; Signal Detection

20010089376 Royal Netherlands Meteorological Inst., Seismology Div., De Bilt, Netherlands

An Optimal Infrasound Array at Apatity (Russian Federation)

Evers, Laeslo, Royal Netherlands Meteorological Inst., Netherlands; Haak, Hein, Royal Netherlands Meteorological Inst., Netherlands; March 2001; 46p; In English; Original contains color illustrations

Report No.(s): KNMI-Publ-195; ISBN 90-369-2193-7; Copyright; Avail: Issuing Activity

Project no. 1341 from the International Science and Technology Center (ISTC) involves the installation of an infrasound array at the seismic array of Apatity. With the existing configuration of the seismic stations, a large number of possible infrasound arrays can be configured (taken co-location with the seismic instruments as boundary condition). Here, the responses for all possible layouts (3, 4 and 5 elements) are calculated and evaluated. On the basis of this, the authors advise to configure the infrasound array of Apatity with all 8 elements available. This array has the most optimum resolution and sensitivity of all evaluated responses, necessary to fulfill the goal of the project being research on infrasound background characteristics. Furthermore, it is

recommended from a financial point of view to partly use differential microbarometers (p.e. K-304AM sensors or KNMI Microbarometers).

Author

Infrasonic Frequencies; Barometers; Arrays; Measuring Instruments

72

ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20010083950 Brookhaven National Lab., Upton, NY USA

Combined Recoil and Threshold Resummation for Hard Scattering Cross Sections

Laenen, E.; Sterman, G.; Vogelsang, W.; Oct. 17, 2000; 8p; In English

Report No.(s): DE2001-773956; BNL-67842; No Copyright; Avail: Department of Energy Information Bridge

We discuss the simultaneous resummation of threshold and recoil enhancements to partonic cross sections due to soft radiation. Our method is based on a refactorization of the parton cross section near its partonic threshold. It avoids double counting, conserves the flow of partonic energy, and reproduces either threshold or recoil resummation when the other enhancements are neglected.

NTIS

Scattering Cross Sections; Partons; Radiation Effects

20010084718 Rice Univ., Chemistry Dept., Houston, TX USA

Why are Buckyonions Round?

Bates, Kevin R., Rice Univ., USA; Scuseria, Gustavo E., Rice Univ., USA; Theoretical Chemistry Accounts; 1998; Volume 99, pp. 29-33; In English

Contract(s)/Grant(s): NAG2-1112; Copyright; Avail: Issuing Activity

Multi-layered round carbon particles (onions) containing tens to hundreds of thousands of atoms form during electron irradiation of graphite. However, theoretical models or large icosahedral fullerenes predict highly faceted shapes for molecules with more than a few hundred atoms. This discrepancy in shape may be explained by the presence of defects during the formation of carbon onions. Here, we use the semi-empirical tight-binding method for carbon to simulate the incorporation of pentagon-heptagon defects on to the surface of large icosahedral fullerenes. We show a simple mechanism that results in energetically competitive derivative structures and a global change in molecular shape from faceted to round. Our results provide a plausible explanation of the apparent discrepancy between experimental observations of round buckyonions and theoretical predictions of faceted icosahedral fullerenes.

Author

Carbon; Particles; Electron Irradiation; Fullerenes; Graphite

20010084913 NASA Goddard Space Flight Center, Greenbelt, MD USA

MU-SPIN Update

Harrington, James, Jr., NASA Goddard Space Flight Center, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 121-128; In English; See also 20010084895; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Current goals are to: (1) Strengthen the science and engineering capabilities of MU-SPIN institutions in research and education via computer networks; (2) Involve and prepare minority institutions and principal investigators to successfully participate in competitive research and education processes via computer networks; and (3) Develop training and education mechanisms to support, sustain and evolve the institutional network infrastructure, thereby generating a better, prepared pool of candidates to contribute to NASA's missions.

Derived from text

Computer Networks; Education; Research; Competition

20010085362 NASA Goddard Space Flight Center, Greenbelt, MD USA

Complex Correlation Calculation of e-H Total Cross Sections

Bhatia, A. K., NASA Goddard Space Flight Center, USA; Temkin, A., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English, 18-24 Jul. 2001, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Calculation of e-H total and elastic partial wave cross sections is being carried out using the complex correlation variational T-matrix method. In this preliminary study, elastic partial wave phase shifts are calculated with the correlation functions which are confined to be real. In that case the method reduces to the conventional optical potential approach with projection operators. The number of terms in the Hylleraas-type wave function for the S phase shifts is 95 while for the S it is 56, except for $k=0.8$ where it is 84. Our results, which are rigorous lower bounds, are given. They are seen to be in general agreement with those of Schwartz, but they are of 0 greater accuracy and outside of his error limits for $k=0.3$ and 0.4 for S. The main aim of this approach' is the application to higher energy scattering. by virtue of the complex correlation functions, the T matrix is not unitary so that elastic and total scattering cross sections are independent of each other. Our results will be compared specifically with those of Bray and Stelbovics.

Author

Scattering Cross Sections; Correlation Coefficients; Elastic Waves

20010086191 Los Alamos National Lab., NM USA

Proton Radiography for an Advanced Hydrotest Facility

Morris, C. L.; Nov. 2000; 18p; In English

Report No.(s): DE2001-768789; LA-UR-00-5716; No Copyright; Avail: Department of Energy Information Bridge

Analysis of data from BNL experiment 933 is presented. Results demonstrate that proton radiography can meet many of the requirements for an Advanced Hydrotest Facility (AHF). Results for background, position resolution, metrology, quantitative radiography, material identification, and edge resolution are presented.

NTIS

Radiography; Protons

20010086403 Oak Ridge National Lab., TN USA

TNG-GENOA User's Manual

Guimaraes, F. B.; Fu, C. Y.; October 2000; 98p; In English

Report No.(s): PB2001-106582; ORNL/TM-2000/252; No Copyright; Avail: National Technical Information Service (NTIS)

The aim of this work is to describe the basic aspects of the codes TNG and GENOA. These codes have been developed and used at ORNL in the last decades for the analysis and evaluation of neutron induced nuclear data. in the energy region of the unresolved resonances range and high energies range. These evaluations have been performed in support of various projects and were included in the ENDF/B library. The implementation of these codes into the code SAMMY has been performed. as part of a program of the creation of a general Nuclear Data evaluation tool for the analysis of reactions in a broad energy range, from few eV up to about 150 MeV.

NTIS

User Manuals (Computer Programs); Computer Programs; Nuclear Reactions

20010086590 Argonne National Lab., IL USA

Predictions for Associated Production of Gauginos and Gluinos at NLO in SUSY-QCD

Berger, E. L.; Klasen, M.; Tait, T.; May 2000; 10p; In English; 35th Rencontres de Moriond Prepared in cooperation with Hamburg Univ. (Germany, F.R.). Inst. fuer Theoretische Physik (II), 18-25 Mar. 2000, Les Arcs, French Guiana

Report No.(s): PB2001-106451; ANL/HEP/CP-00-057; No Copyright; Avail: National Technical Information Service (NTIS)

The search for supersymmetry (SUSY) is a major goal of the Tevatron Run 11 and LHC physics programs. If SUSY exists at the electroweak scale, SUSY partners of the Standard Model (SM) particles will either be discovered at these hadron colliders, or a very large region of SUSY parameter space will be excluded, provided reliable theoretical predictions in next-to-leading 12314. We calculate the NLO contributions for associated order (NLO) SUSY-QCD are available 56 This production channel is enhanced production of gauginos and gluinos at hadron colliders by the strong coupling of the gluino and by the mass of the gaugino which is small in many popular models of SUSY breaking. The leptonic decay of the gaugino makes this process a good candidate for a mass determination of the gluino or the discovery or exclusion of a light gluino.

NTIS

Supersymmetry; Electroweak Interactions (Field Theory); Hadrons; Particle Accelerators

20010086592 NASA Marshall Space Flight Center, Huntsville, AL USA

Preparation and Preliminary Characterization of Crystallizing Fluorescent Derivatives of Chicken Egg White Lysozyme

Sumida, John, NASA Marshall Space Flight Center, USA; Forsythe, Elizabeth L., NASA Marshall Space Flight Center, USA; Pusey, Marc L., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Fluorescence is one of the most versatile and powerful tools for the study of macromolecules. While most proteins are intrinsically fluorescent, working at crystallization concentrations require the use of covalently prepared derivatives added as tracers. This approach requires derivatives that do not markedly affect the crystal packing. We have prepared fluorescent derivatives of chicken egg white lysozyme with probes bound to one of two different sites on the protein molecule. Lucifer yellow and 5-(2-aminoethyl)aminonaphthalene-1-sulfonic acid (EDANS) have been attached to the side chain carboxyl of Asp(sup 101) using a carbodiimide coupling procedure. Asp(sup 101) lies within the active site cleft, and it is believed that the probes are "buried" within that cleft. Lucifer yellow and MANS probes with iodoacetamide reactive groups have been bound to His(sup 15), located on the "back side" of the molecule relative to the active site. All the derivatives fluoresce in the solution and the crystalline states. Fluorescence characterization has focused on determination of binding effects on the probe quantum yield, lifetime, absorption and emission spectra, and quenching by added solutes. Quenching studies show that, as postulated, the Asp(sup 101)-bound probes are partially sheltered from the bulk solution by their location within the active site cleft. Probes bound to His(sup 15) have quenching constants about equal to those for the free probes, indicating that this site is highly exposed to the bulk solution.

Author

Lysozyme; Crystallization; Derivation; Macromolecules; Fluorescence; Characterization; Crystal Structure

20010086952 National Nuclear Data Center, Upton, NY USA

Evaluated Nuclear Structure Data File: A Manual for Preparation of Data Sets

Tuli, J. K.; Feb. 2001; 118p; In English

Report No.(s): DE2001-779777; BNL-NCS-51655-01/02-REV; No Copyright; Avail: Department of Energy Information Bridge

The structure and the format for the Evaluated Nuclear Structure Data FILE (ENSDF) is described. ENSDF is used to store nuclear structure properties of nuclides and the results of various experiments to derive those properties.

NTIS

Nuclear Structure; Manuals; Nuclear Physics; Data

20010087028 NASA Ames Research Center, Moffett Field, CA USA

On Interpreting the Photoelectron Spectra of MgO

Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Partridge, Harry, NASA Ames Research Center, USA; [2001]; 16p; In English

Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The (sup 2)Sigma(+) and (sup 2)Pi states of MgO(-) and the (sup 1)Sigma(+), (sup 1)Pi, and (sup 3)Pi states of MgO are studied using the averaged coupled-pair functional (ACPF) approach. The computed spectroscopic constants are in good agreement with the available experimental data. The computed Franck-Condon factors and photodetachment overlaps are compared with experiment.

Author

Magnesium Oxides; Photoelectron Spectroscopy; Binding Energy; Photodetachment

20010087436 Argonne National Lab., High Energy Physics Div., IL USA

Constraints on the Proton's Gluon Density from Lepton-Pair Production

Berger, E. L.; Klasen, M.; 2000; 10p; In English

Report No.(s): PB2001-106453; ANL-HEP-CO-00-098; No Copyright; Avail: National Technical Information Service (NTIS)

Massive lepton-pair production, the Drell-Yan process, should be a good source of independent constraints on the gluon density, free from the experimental and theoretical complications of photon isolation that beset studies of prompt photon production. We provide predictions for the spin-averaged and spin-dependent differential cross sections as a function of transverse momentum QT.

NTIS

Leptons; Pair Production; Gluons; Quantum Mechanics

20010087438 California Inst. of Tech., Norman Bridge Lab. of Physics, Pasadena, CA USA

Quantum Teleportation Final Report, 17 May 1999 - 28 Feb. 2001

Kimble, H. J.; Feb. 2001; 70p; In English

Contract(s)/Grant(s): DAAD19-99-1-0230

Report No.(s): AD-A390681; ARO-30029.1-PH; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Research underway in the Quantum Optics Group at Caltech explores quantum information processing with continuous quantum variables. The most noteworthy success of this program has been the experimental realization of quantum teleportation for coherent states of the electromagnetic field. Beyond our effort to extend these results to achieve yet higher quality" of teleportation, we have initiated new research on several fronts, including super-dense quantum coding and teleportation of atomic wavepackets. The research is part of a larger program to lay the foundations for the realization of quantum networks for the distribution and processing of quantum information.

DTIC

Quantum Optics; Electromagnetic Fields; Quantum Theory

20010088086 Oak Ridge National Lab., TN USA

MCNP-DSP Users Manual

Valentine, T. E.; January 2001; 128p; In English

Report No.(s): PB2001-106600; ORNL/TM-13334/R2; No Copyright; Avail: National Technical Information Service (NTIS)

The Monte Carlo code MCNP-DSP was developed from the Los Alamos MCNP4a code to calculate the time and frequency response statistics obtained from subcritical measurements. The code can be used to simulate a variety of subcritical measurements including source-driven noise analysis, Rossi-alpha, pulsed source, passive frequency analysis, multiplicity, and Feynman variance measurements. This code can be used to validate Monte Carlo methods and cross section data sets with subcritical measurements and replaces the use of point kinetics models for interpreting subcritical measurements.

NTIS

Monte Carlo Method; User Manuals (Computer Programs); Frequency Response; Mathematical Models

20010088357 Institute of Space Medico-Engineering, Beijing, China

Response of Lithium Fluoride Detector to Charged Particle LET

Wang, Gen-Liang, Institute of Space Medico-Engineering, China; Qi-Zhang-Nian, Institute of Space Medico-Engineering, China; Chen, Mei, Institute of Space Medico-Engineering, China; Huang, Zeng-Xin, Institute of Space Medico-Engineering, China; Xu, Zhen-Hua, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; April 2001; ISSN 1002-0837; Volume 14, No. 2, pp. 154-156; In Chinese; Copyright; Avail: Issuing Activity

Response of LiF thermoluminescence (TL) detector to charged particle is dependent on particles' LET. High LET can cause reduction of detector response and underestimation of radiation dose. This paper summarized the response of LiF detector to charged particles' LET, and suggested a new approach to solve the dose contribution of high LET charged particles.

Author

Charged Particles; Lithium Fluorides; Detectors; Thermoluminescence

20010089237 Maryland Univ., College Park, MD USA

Measurement of Deuteron Tensor Polarization in Elastic Electron Scattering

Gustafsson, K. K.; 2000; 234p; In English

Report No.(s): DE2001-767960; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The JLab electron accelerator with its intermediate energy high current continuous wave beam combined with the Hall C high resolution electron spectrometer and a deuteron recoil polarimeter provided experiment E94018 with the opportunity to study the deuteron electromagnetic structure, in particular to measure the tensor polarization observable t_{20} , at higher four momentum transfers than ever before. This dissertation presents results of JLab experiment E94018. The remainder of this first chapter will present some basic properties of the deuteron, introduce formalism associated with the experiment, give an overview of various theoretical models, and discuss previous measurements of t_{20} . The experimental setup of the calibration measurement performed at Saturn and in particular the experimental setup of the tensor polarization t_{20} measurement performed a JLab is described in Chapter 2. The data reduction and the data analysis are covered in Chapter 3. The results of the JLab experiment are presented in Chapter 4. Results of the luminosity scan data analysis are presented in Appendix B.

NTIS

Deuterons; Electron Accelerators; Electron Spectroscopy; Mathematical Models; Polarimeters

20010089238 Fermi National Accelerator Lab., Batavia, IL USA

Scheme to Extract a Low Intensity Slow Spill Main Injector Beam to the Meson Area Without Compromising Antiproton Production Rate

Mishra, C. S.; Murphy, T.; Raja, R.; Oct. 2000; 18p; In English

Report No.(s): DE2001-767328; FERMILAB-TM-2131; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We propose a scheme to extract a low intensity beam of 120 GeV Main Injector protons to the Meson Area while simultaneously fast extracting protons for antiproton production such that the total antiproton production rate is unaffected. We achieve this by injecting two booster batches into the Main Injector. At the beginning of at-top, a single booster batch is extracted to the antiproton source. The remaining batch is used to provide a slow spill to the meson area of low intensity. At the end of the slow spill, the total amount of beam extracted to meson area is less than 10% of the remaining batch which is extracted to the antiproton source providing two batches for anti-proton production in a period of approximately 3 seconds, thus preserving the rate of antiproton production.

NTIS

Antiprotons; Injectors; Mesons

20010089239 Fermi National Accelerator Lab., Batavia, IL USA

Neutrino Oscillation Scenarios and GUT Model Predictions

Albright, C. H.; Oct. 2000; 16p; In English

Report No.(s): DE2001-766384; FERMILAB-CONF-00/278-T; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The present experimental situation regarding neutrino oscillations is first summarized, followed by an overview of selected grand unified models which have been proposed to explain the various scenarios with three active neutrinos and their right-handed counterparts. Special attention is given to the general features of the models and their ability to favor some scenarios over others.

NTIS

Neutrinos; Oscillations; Grand Unified Theory; Mathematical Models

20010089246 Argonne National Lab., IL USA

Commissioning of Experimental Enclosures ('Hutches') at the Advanced Photon Source: A to Z ALARA

Vacca, J.; Job, P. K.; Rauchas, A.; Justus, A.; Veluri, V. R.; 2001; 16p; In English

Report No.(s): DE2001-768591; ANL/AOD/CP-103175; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The advanced photon source (APS), 7 GeV electron Storage Ring is designed to be a major national user facility providing high-brilliance x-ray beams. At completion, APS will have 35 bending magnet (BM) beamlines and 35 insertion device (ID) beamlines. A typical x-ray beamline at APS comprises of a front end (FE) that confines the beam; a first optics enclosure (FOE) which houses optics to filter and monochromatize the beam; and beam transports, additional optics, and the experiment stations. This paper describes in some detail the steps involved in the process of commissioning experimental stations and the implementation of the ALARA at each step.

NTIS

X Rays; Photon Beams; Bending; Magnetization

73

NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see 93 Space Radiation. For atomic and molecular physics see 72 Atomic and Molecular Physics. For elementary particle physics see 77 Physics of Elementary Particles and Fields. For nuclear astrophysics see 90 Astrophysics.

20010083874 Brookhaven National Lab., Upton, NY USA

RHIC Status and Requirements

Roser, T.; 2001; 10p; In English

Report No.(s): DE2001-775084; BNL-67966; No Copyright; Avail: Department of Energy Information Bridge

Construction of the Brookhaven Relativistic Heavy Ion Collider (RHIC) was officially completed last year and commissioning has begun. RHIC is the first hadron accelerator and collider consisting of two independent rings. It is designed

to operate over a wide range of beam energies and with particle species ranging from polarized protons to heavy ions. An overview of the status of commissioning and operation with gold is given and requirements for possible new ion sources are discussed.

NTIS

Ion Sources; Heavy Ions; Ion Beams

20010083951 Brookhaven National Lab., Upton, NY USA

Conceptual Design Studies of a Neutron Source at the BNL-HFBR Facility

Hastings, J.; Montanez, P.; Todosow, M.; 2001; 16p; In English

Report No.(s): DE2001-773952; BNL-67845; No Copyright; Avail: Department of Energy Information Bridge

Following the shutdown of the High Flux Beam Reactor (HFBR) it has been proposed to substitute the reactor based source with a CW accelerator driven source. Both sub-critical assemblies and spallation sources have been explored. The accelerator driven sub-critical assemblies include a spallation neutron source surrounded by a sub-critical blanket. The neutron source is a bed of randomly packed (184)W spheres cooled by heavy water. The sub-critical blanket consists of a co-axial bed of randomly packed coated graphite spheres, which have been infiltrated with uranium carbide. The uranium is 20% enriched, and has a volume averaged density of 1.0 g/cc. The spallation source only option consists of a target design which is conceptually the same as the neutron sources, described above, used in the driven sub-critical sources. The surrounding reflector in both cases consists of an inner Be/D(2)O volume and a larger D(2)O outer volume. Both volumes are co-axial with the source.

NTIS

Neutron Sources; High Flux Beam Reactors; Linear Accelerators

20010083952 Argonne National Lab., IL USA

Liquid-Lithium Cooling for 100-kW ISOL and Fragmentation Targets

Nolen, J. A.; Reed, C. B.; Hassanein, A.; Gomes, I. C.; 2001; 16p; In English

Report No.(s): DE2001-772106; ANL/PHY/CP-103347; No Copyright; Avail: Department of Energy Information Bridge

Advanced exotic beam facilities that are currently being developed will use powerful driver accelerators for the production of short-lived rare isotopes. Multi-beam drivers capable of producing high power beams from very light to very heavy ions are now technically feasible. A challenge for such facilities is the development of production targets to be used for a variety of reaction mechanisms with beam powers of about 100 kilowatts. This paper presents engineering concepts that have been developed recently for using liquid lithium coolant for two types of targets, one for use with light-ion beams on high atomic number (Z) targets and the other for heavy-ion beams on low-Z targets.

NTIS

Liquid Lithium; Cooling; Fragmentation; Coolants

20010087431 Oak Ridge National Lab., Computational Physics and Engineering Div., TN USA

Benchmark Analysis of the MIX-COMP-THERM-O2 Experiments Using the SCALE/CENTRM Sequence

Hollenbach, D. F.; Jan. 04, 2001; 10p; In English; American Nuclear Society Annual Meeting (2001) and Embedded Topical Meetings, 17-21 Jun. 2001, Milwaukee, WI, USA

Report No.(s): PB2001-106598; No Copyright; Avail: National Technical Information Service (NTIS)

This paper examines a set of lattice problems to evaluate the differences between the NITAWL resonance processor and the CENTRM/PMC resonance processor. NITAWL uses the Nordheim Integral Treatment to process resolved resonances while CENTRM/PMC produces point-wise fluxes, which are then used to collapse point cross-sections. The purpose of this report is to determine the effect of resonance overlap on Mixed-Oxide systems. NITAWL processes resonances individually, not taking into account the change in the background cross-section. CENTRM/PMC does not contain this potential problem since it calculates a point-flux using all resonances from all materials simultaneously.

NTIS

Mixed Oxides; Scattering Cross Sections; Resonance Scattering

20010087434 Argonne National Lab., IL USA

Transformer Ratio Enhancement Using a Ramped Bunch Train in a Collinear Wakefield Accelerator

Power, J. G.; Gai, W.; Kanareykin, A.; 2001; 18p; In English; (9th) Advanced Accelerator Concepts Workshop, 10-16 Jun. 2000, Sante Fe, NM, USA

Report No.(s): PB2001-106455; ANL-HEP-CP-00-102; No Copyright; Avail: National Technical Information Service (NTIS)

We present a practical method for achieving a transformer ratio (R) greater than 2 with any collinear wakefield accelerator - i.e. with either plasma or structure based wakefield accelerators. It is known that the transformer ratio cannot generally be greater

than 2 for a symmetric chive bunch in a collinear wakefield accelerator. However, using a ramped bunch train (RBT) where a train of n electron drive bunches, with increasing ('ramping') charge, one can achieve $R = 2n$ after the bunch train. We believe this method is feasible from an engineering standpoint using existing technology and an experiment to be preformed at the Argonne Wakefield Accelerator (AWA) is planned.

NTIS

Collinearity; Transformers; Mathematical Models; Accelerators

20010087435 Argonne National Lab., IL USA

Experimental Measurements of Wakefields in a Multimode, Dielectric Structure Driven by a Train of Electron Bunches

Power, J. G.; Conde, M. E.; Gai, W.; Kanareyken, A.; Konecny, R.; 2001; 14p; In English; 9th Advanced Accelerator Concepts Workshop, 10-16 Jun. 2000, Sante Fe, NM, USA

Report No.(s): PB2001-106454; ANL-HEP-CP-00-103; No Copyright; Avail: National Technical Information Service (NTIS)

We report on the experimental results of a new wakefield acceleration scheme. The multibunch driven, multimode, dielectric wakefield accelerator was demonstrated at the Argonne Wakefield Accelerator (AWA). In this experiment, a bunch train of 4, 5 nC electron bunches, separated by 760 ps, was passed through a 60 cm long dielectric-lined cylindrical waveguide. The separation was chosen to match the net acceleration wavelength of the multimode structure. By carefully measuring the energy spectrum of the 4 beams after they passed through the waveguide, we demonstrated that the wakefield is indeed enhanced by a train of periodically spaced electron bunches. The analysis of the multimode structure driven by a bunch train was done by a trivial extension to the existing theory since we are operating in the linear regime. This work represents the fast experimental demonstration of this concept and also shows that multibunch operation of wakefield accelerators is worthy of further investigation.

NTIS

Electron Bunching; Mathematical Models; Dielectric Waveguides; Beamforming

20010087437 Argonne National Lab., High Energy Physics Div., IL USA

Next-to-Leading Order SUSY-QCD Calculation of Associated Production of Gauginos and Gluinos

Berger, E. L.; Tait, T. M. P.; Klasen, M.; 2000; 10p; In English

Report No.(s): PB2001-106452; ANL/HEP/CP-00-097; No Copyright; Avail: National Technical Information Service (NTIS)

Results are presented of a next-to-leading order calculation in perturbative QCD of the production of charginos and neutralinos in association with gluinos at hadron colliders. Predictions for cross sections are shown at the energies of the Fermilab Tevatron and CERN Large Hadron Collider for a typical supergravity (SUGRA) model of the sparticle mass spectrum and for a light gluino model.

NTIS

Elementary Particles; Hadrons; Particle Accelerators; Quantum Chromodynamics; Supersymmetry

20010088175 Colorado Univ., Lab. of Atmospheric and Space Physics, Boulder, CO USA

POLAR/CEPPAD Data Analysis Final Report

Baker, D. N., Colorado Univ., USA; [2001]; 16p; In English

Contract(s)/Grant(s): NAS5-97140; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This final report provides a final report on a NASA sponsored project involving data reduction and scientific analysis related to the Comprehensive Energetic Particle Pitch Angle Distribution (CEPPAD) experiment of POLAR. Dr. D.N. Baker, the chief scientist, has focused primarily on the calibration of CEPPAD sensors and the interpretation of data from the sensors which has led to discoveries regarding storm-substorm relationships in the earth's magnetosphere. The report contains approximately 190 bibliographic references to the activities of Baker and others involved.

CASI

Bibliographies; Data Reduction; Energetic Particles; Angular Distribution; Earth Magnetosphere

20010089245 Argonne National Lab., IL USA

Experiments with Radioactive Samples at the Advanced Photon Source

Veluri, V. R.; Justus, A.; Glagola, B.; Rauchas, A.; Vacca, J.; 2001; 14p; In English

Report No.(s): DE2001-768598; ANL/AOD/CP-103199; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The advanced photon source (APS), 7 GeV electron Storage Ring is designed to be a major national user facility providing high-brilliance x-ray beams. At completion, APS will have 35 bending magnet (BM) beamlines and 35 insertion device (ID)

beamlines. A typical x-ray beamline at APS comprises of a front end (FE) that confines the beam; a first optics enclosure (FOE) which houses optics to filter and monochromatize the beam; and beam transports, additional optics, and the experiment stations. This paper describes in some detail the steps involved in the process of commissioning experimental stations and the implementation of the ALARA at each step.

NTIS

Photons; Radioactivity; Storage Rings (Particle Accelerators); X Rays

74 OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20010083348 Ecole Polytechnique, Lab. pour l'Utilisation des Lasers Intenses, Palaiseau, France

Utilization of Intense Lasers: LULI Annual Report 2000, Plasma Physics on LULI Facilities *Laboratoire pour l'Utilisation Des Lasers Intenses: Rapport Scientifique 2000*

Amiranoff, F.; Jun. 2001; 174p; In French

Report No.(s): PB2001-106320; No Copyright; Avail: Issuing Activity

Work performed at LULI during the year 2000 is described in a set of 58 original contributions covering topics such as: laser-matter interaction, shocks, hydrodynamics, equations of states, atomic physics, X-ray lasers and laser developments.

NTIS

Plasma Physics; X Ray Lasers

20010083995 Hokkaido Univ., Faculty of Engineering, Sapporo, Japan

Two Dimensional Quasi-Phase-Matching for Optical Second Harmonic Generation

Koyanagi, Kojiro, Hokkaido Univ., Japan; Mishima, Teruhito, Hokkaido Univ., Japan; Bulletin of the Faculty of Engineering, Hokkaido University; February 1994; ISSN 0385-602X, No. 168, pp. 33-38; In Japanese; Copyright Waived; Avail: Issuing Activity

A new technique is proposed for quasi-phase-matched (QPM) second harmonic generation (SHG) in a nonlinear bulk crystal with domain inverted structures, where two fundamental waves propagate in different directions. The residual mismatch caused by fabrication errors or by the shift of the wavelength is easily compensated by readjusting the incident directions.

Author

Phase Matching; Harmonic Generations

20010085346 NASA Goddard Space Flight Center, Greenbelt, MD USA

Multi-Frequency Soliton Complex in Er/Yb-Doped Fiber Amplifier

Kang, Jin U., Johns Hopkins Univ., USA; Kim, Do-Hyun, Johns Hopkins Univ., USA; Khurgin, Jacob B., Johns Hopkins Univ., USA; Akhmediev, Nail N., Australian National Univ., Australia; Han, Haewook, Pohang Univ. of Science and Technology, Korea, Republic of; Shaw, Harry, NASA Goddard Space Flight Center, USA; [2001]; 2p; In English; CLEO 2001 Conference, 15-19 Jul. 2001, Tokyo, Japan; No Copyright; Avail: British Library Lending (BLL) Division, Boston Spa, England; Abstract Only

We experimentally investigated presence of multi-frequency soliton complex that exist in high power Er/Yb-doped Fiber Amplifier. The complex with the spectral bandwidth in excess of 100 nm is bound by the Kerr nonlinearity and exhibit stable propagation.

Author

Doped Crystals; Erbium; Ytterbium; Solitary Waves; Frequencies; Optical Fibers

20010085348 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Stellar Imager (SI) Mission Concept

Carpenter, Kenneth G., NASA Goddard Space Flight Center, USA; Neff, Susan G., NASA Goddard Space Flight Center, USA; Armstrong, Thomas J., Naval Research Lab., USA; Pauls, Thomas A., Naval Research Lab., USA; Schrijver, Carolus J., Stanford-Lockheed Inst. for Space Research, USA; [2001]; 1p; In English; 36th Liege International Astrophysical Colloquium, Liege, Belgium; No Copyright; Avail: Issuing Activity; Abstract Only

The Stellar Imager (SI) is envisioned as a space-based, UV optical interferometer composed of 10 or more one-meter class elements distributed with a maximum baseline of 0.5 km. It will image stars and binaries with one hundred to one thousand resolution elements on their surface and enable long-term studies of stellar magnetic activity patterns and their evolution with time,

for comparison with those on the sun. It will also sound their interiors through asteroseismology to image internal structure, differential rotation, and large-scale circulations. SI will enable us to understand the various effects of magnetic fields of stars, the dynamos that generate them, and the internal structure and dynamics of the stars in which they exist. The ultimate goal is to achieve the best-possible forecasting of solar activity on times scales ranging up to decades, and an understanding of the impact of stellar magnetic activity on astrobiology and life in the Universe. The road to that goal will revolutionize our understanding of stars and stellar systems, the building blocks of the Universe. Fitting naturally within the NASA and ESA long-term time lines, SI complements defined missions, and with them will show us entire other solar systems, from the central star to their orbiting planets. In this paper we will describe the scientific goals of the mission, the performance requirements needed to address those goals, and the design concepts now under study.

Author

Asteroseismology; Space Missions; Stellar Systems; Telescopes

20010086219 NASA Marshall Space Flight Center, Huntsville, AL USA

Overview of SBMD, NMSD and AMSD

Stahl, H. Philip, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

For the past several years, NASA has conducted a coordinated mirror technology development program via SBIR's and contracts. This presentation provides a programmatic overview of three specific projects: SBMD (Subscale Beryllium Mirror Demonstrator), NMSD (NGST Mirror System Demonstrator) and AMSD (Advanced Mirror System Demonstrator). Specific emphasis will be given to technical constraints and objectives.

Author

Beryllium; Mirrors; Proving

20010086593 Arizona Univ., Tucson, AZ USA

[2-m Diameter NGST Mirror System Demonstrator]

Burge, Jim, Arizona Univ., USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA
Contract(s)/Grant(s): NAS8-97309; No Copyright; Avail: Issuing Activity; Abstract Only

The University of Arizona is manufacturing a 2-m diameter NGST Mirror System Demonstrator. This mirror uses a 2-mm thick glass facesheet as the optical surface. The shape is controlled and adjusted using 166 actuators that are mounted into a composite carbon fiber structure. The overall mass density for the mirror system is 13 kg/sq m, including glass, attachments, actuators, cabling, and support structure. The mirror operates at ambient temperatures and at cryogenic temperatures using custom built actuators and couplings. The status of the mirror fabrication will be presented.

Author

Cryogenic Temperature; Ambient Temperature; Composite Structures; Mirrors; Carbon Fibers

20010086595 NASA Marshall Space Flight Center, Huntsville, AL USA

COI Structural Analysis Presentation

Cline, Todd, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA

Contract(s)/Grant(s): NAS8-00187; No Copyright; Avail: Issuing Activity; Abstract Only

This report discusses the structural analysis of the Next Generation Space Telescope Mirror System Demonstrator (NMSD) developed by Composite Optics Incorporated (COI) in support of the Next Generation Space Telescope (NGST) project. The mirror was submitted to Marshall Space Flight Center (MSFC) for cryogenic testing and evaluation. Once at MSFC, the mirror was lowered to approximately 40 K and the optical surface distortions were measured. Alongside this experiment, an analytical model was developed and used to compare to the test results. A NASTRAN finite element model was provided by COI and a thermal model was developed from it. Using the thermal model, steady state nodal temperatures were calculated based on the predicted environment of the large cryogenic test chamber at MSFC. This temperature distribution was applied in the structural analysis to solve for the deflections of the optical surface. Finally, these deflections were submitted for optical analysis and comparison to the interferometer test data.

Author

Next Generation Space Telescope Project; Cryogenics; Structural Analysis; Mirrors; Deflection

20010086631 Argonne National Lab., Materials Science and Technology Div., IL USA

Brillouin Scattering and Diffracted MOKE from Arrays of Dots and Anti-Dots

Grimsditch, M.; Guedes, I.; Vavassori, P.; Metlushko, V.; Ilic, B.; 2001; 24p; In English

Report No.(s): DE2001-768580; ANL/MSD/CP-102397; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The magnetic properties of nano-arrays have been investigated using Brillouin scattering, MOKE and Diffracted-MOKE techniques. The anisotropies in negative arrays are found to be due to the shape of the holes and not due to the array itself. The D-MOKE results allow us to extract the domain pattern at remanence.

NTIS

Magnetic Properties; Arrays; Diffraction; Technology Transfer

20010087031 Massachusetts Inst. of Tech., Space Nanotechnology Research, Cambridge, MA USA

Development of Accurate Structure for Mounting and Aligning Thin-Foil X-Ray Mirrors *Final Report*

Heilmann, Ralf K., Massachusetts Inst. of Tech., USA; [2001]; 2p; In English

Contract(s)/Grant(s): NCC5-330; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goal of this work was to improve the assembly accuracy for foil x-ray optics as produced by the high-energy astrophysics group at the NASA Goddard Space Flight Center. Two main design choices lead to an alignment concept that was shown to improve accuracy well within the requirements currently pursued by the Constellation-X Spectroscopy X-Ray Telescope (SXT).
Derived from text

Foils (Materials); Mirrors; X Ray Optics; Design Analysis

20010087668 NASA Goddard Space Flight Center, Greenbelt, MD USA

Overview of Selected Light-Weight Mirror Development Programs at GSFC

Keski-Kuha, Ritva A., NASA Goddard Space Flight Center, USA; Content, David A., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This paper discusses selected light-weight mirror development programs at GSFC, including development of light-weight, precision, low scatter imaging mirror for ultraviolet applications, foam core mirrors for visible and IR applications, and light-weight SiC mirrors.

Author

Imaging Techniques; Mirrors; Research and Development

20010089268 Swales Aerospace, Beltsville, MD USA

STOP Analysis and Optimization of a Very-Low-Distortion Space Instrument: HST WFC3 Case Study

Kunt, Cengiz, Swales Aerospace, USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 MAY 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

New generation optical instruments with very demanding stability requirements are being proposed and developed for space applications. STOP (Structural-Thermal-Optical Performance) analysis and optimization is crucial in meeting the very tight distortion budgets of these instruments. This presentation outlines STOP analysis and optimization approach in the context of WFC3 (Wide-Field Camera 3), which is a radial instrument designed to replace the Wide-Field Planetary Camera 2 (WFPC2) of the Hubble Space Telescope (HST). WFC3 houses two separate channels, UVIS and IR, and will have greater throughput and sensitivity than WFPC2. WFC3 line-of-sight alignment budget for the UVIS and IR channels are as small as 10 and 20 milli-arcsec, respectively. Its optical bench is the most critical subsystem effecting the optical stability of WFC3 hence our effort concentrates on the design and analysis of the bench and its interfaces. Structural analysis has accompanied the mechanical design of the bench since the initial concept study. A high fidelity structural Finite Element Model (FEM) of the bench has been developed and used for minimizing its thermally induced distortions as well as sizing it to meet the stiffness and strength requirements of a Shuttle launch. The bench is a composite honeycomb panel box structure with a very low planar Coefficient of Thermal Expansion (CTE) of approximately 0.1 ppm/C. Optic components are mounted to super-INVAR inserts bonded into the panels. The bench is kinematically supported on three HST latches via interface struts, which are tailored to exhibit negative CTE to cancel out the thermal motions of the latches. The interface struts also incorporate flexure elements to minimize the mechanical distortions coming into the bench from its enclosure. Bench FEM is coupled with the enclosure FEM to quantify these effects. Short term or on-orbit STOP analysis includes distortion due to the temperature variations of the bench, the struts, and the enclosure. Long term or ground-to-orbit STOP analysis includes distortional effects of gravity release, desorption, and assembly in addition to the ground-to-orbit temperature variations. A rigorous testing program has been implemented for verifying the

material properties and the analysis predictions. STOP analysis results demonstrate that both the short-term and the long-term alignment budgets will be met. Presentation will cover design and analysis details that are critical to a successful implementation of the STOP analysis and optimization process.

Author

Stability Tests; Structural Analysis; Spacecraft Instruments; Optical Equipment

20010089364 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Integrated Modeling of Optical Systems (IMOS): An Assessment and Future Directions

Moore, Gregory, Jet Propulsion Lab., California Inst. of Tech., USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Integrated Modeling of Optical Systems (IMOS) is a finite element-based code combining structural, thermal, and optical ray-tracing capabilities in a single environment for analysis of space-based optical systems. We'll present some recent examples of IMOS usage and discuss future development directions. Due to increasing model sizes and a greater emphasis on multidisciplinary analysis and design, much of the anticipated future work will be in the areas of improved architecture, numerics, and overall performance and analysis integration.

Author

Computerized Simulation; Computer Programs; Space Based Radar

75

PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20010084293 Princeton Univ., Plasma Physics Lab., NJ USA

Raman Forward Scattering in Plasma Channels

Shvets, G.; Li, X.; Nov. 2000; 20p

Report No.(s): DE2001-768664; PPPL-3520; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Raman scattering instability of an intense laser pulse in a plasma channel proceeds differently than in a homogeneous plasma: the growth rate is reduced and the scaling with the laser intensity modified. These differences, significant even for shallow plasma channels, arise because of the radial shear of the plasma frequency and the existence of the weakly damped hybrid (electrostatic/electromagnetic) modes of the radially inhomogeneous plasma. The interplay of these two effects produces double-peaked spectra for the forward scattering in a channel.

NTIS

Electrostatics; Forward Scattering; Raman Spectra; Channel Capacity; Stability

20010084295 Princeton Univ., Plasma Physics Lab., NJ USA

Recent Progress in MHD Stability Calculations of Compact Stellarators

Fu, G. Y.; Redi, M. H.; Kessel, C.; Monticello, D. A.; Ku, L. P.; Nov. 2000; 16p; In English

Report No.(s): DE2001-768647; PPPL-3505; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A key issue for compact stellarators is the stability of beta-limiting MHD modes, such as external kink modes driven by bootstrap current and pressure gradient. We report here recent progress in MHD stability studies for low-aspect-ratio Quasi-Axisymmetric Stellarators (QAS) and Quasi-Omnigeneous Stellarators (QOS). We find that the $N = 0$ periodicity-preserving vertical mode is significantly more stable in stellarators than in tokamaks because of the externally generated rotational transform. It is shown that both low- n external kink modes and high- n ballooning modes can be stabilized at high beta by appropriate 3D shaping without a conducting wall. The stabilization mechanism for external kink modes in QAS appears to be an enhancement of local magnetic shear due to 3D shaping. The stabilization of ballooning mode in QOS is related to a shortening of the normal curvature connection length.

NTIS

Magnetohydrodynamic Stability; Stellarators; Pressure Gradients; Stability Augmentation

20010084299 Princeton Univ., Plasma Physics Lab., NJ USA

Global Stability of the Field Reversed Configuration

Belova, E. V.; Jardin, S. C.; Ji, H.; Kulsrud, R. M.; Park, W.; Nov. 2000; 12p; In English

Report No.(s): DE2001-768402; PPPL-3502; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

New computational results are presented which provide a theoretical basis for the stability of the Field Reversed Configuration (FRC). The FRC is a compact toroid with negligible toroidal field in which the plasma is confined by a poloidal magnetic field associated with toroidal diamagnetic current. Although many MHD modes are predicted to be unstable, FRCs have been produced successfully by several formation techniques and show surprising macroscopic resilience. In order to understand this discrepancy, we have developed a new 3D non-linear hybrid code (kinetic ions and fluid electrons), M3D-B, which is used to study the role of kinetic effects on the $n = 1$ tilt and higher n modes in the FRC. Our simulations show that there is a reduction in the tilt mode growth rate in the kinetic regime, but no absolute stabilization has been found for s is less than 1, where s is the approximate number of ion gyroradii between the field null and the separatrix.

NTIS

Nonlinearity; Diamagnetism; Three Dimensional Models; Toroidal Plasmas; Magnetic Field Configurations; Stability

20010084622 Eloret Corp., Moffett Field, CA USA

A Self-Consistent Plasma-Sheath Model for the Inductively Coupled Plasma Reactor

Bose, Deepak, Eloret Corp., USA; Govindam, T. R., Eloret Corp., USA; Meyyappan, M., Eloret Corp., USA; [2000]; 1p; In English; Gaseous Electronics Conference, Oct. 2000, Houston, TX, USA

Contract(s)/Grant(s): NAS2-99092; RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

Accurate determination of ion flux on a wafer requires a self-consistent, multidimensional modeling of plasma reactor that adequately resolves the sheath region adjoining the wafer. This level of modeling is difficult to achieve since non-collisional sheath lengths are usually 3-4 orders of magnitude smaller than the reactor scale. Also, the drift-diffusion equations used for ion transport becomes invalid in the sheath since the ion frictional force is no longer in equilibrium with drift and diffusion forces. The alternative is to use a full momentum equation for each ionic species. In this work we will present results from a self-consistent reactor scale-sheath scale model for 2D inductively coupled plasmas. The goal of this study is to improve the modeling capabilities and assess the importance of additional physics in determining important reactor performance features, such as the ion flux uniformity, coil frequency and configuration effects, etc. Effect of numerical dissipation on the solution quality will also be discussed.

Author

Flux (Rate); Plasmas (Physics); Scale Models; Wafers; Friction Factor

20010085370 Academy of Sciences (USSR), Inst. for High Temperature, Moscow, USSR

Optimization of Plasma Generators (PG) and Operational Modes of Plasma Assisted Combustion *Final Report*

Klimov, Anatoly; Jun. 30, 2001; 22p; In English; Original contains color plates

Report No.(s): AD-A392647; EOARD-ISTC00-7007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Institute for High Temperature - RAS (IVTAN) as follows: Plasma assisted engine combustion is a newly developed field of basic science that brings together the fields of engine combustion physics and plasma physics. This project is devoted to a fundamental study of optimal regimes of stimulated burning of engine fuel/air mixtures by means of structural, non-equilibrium plasma formations (plasmoids). MTC, IVT RAS has significant experience in this field, and has produced breakthrough experimental results. For the first time, we have obtained stable engine combustion, stimulated by streamer HF discharge of a very poor fuel/air engine mixture (Argon: Propane=9:1), in a gas mixture engine flow. In addition, we have experimental results in gas engine flows of advanced mixtures with plasma formations. We plan to continue our research in the field of plasma assisted engine combustion with non-equilibrium plasmoids. These plasmoids will be created by highly efficient plasma generators (PG) of the following types: PG HF for creation of streamer corona discharge; PG-jet, plasma generator of erosive plasma jet; PG-Comb. Combined discharge could be created by combined PG (PG HF+ PG-jet) in a repetitive pulsed mode, and the main plasma parameters can be changed independently. Electron concentration can be controlled by the PG-jet, and the electron temperature can be controlled by the external HF electric field. The main goals of this work are to study the following: optimal radical generation in an engine fuel/air mixture by plasmoids; stability of the burning of the engine fuel/air mixture in an engine gas flow stimulated by plasma formations; advanced mixtures of engine fuel in an engine gas flow by structural plasmoids.

DTIC

Combustion Physics; Plasma Generators; Gas Mixtures; High Temperature; Optimization; Internal Combustion Engines

20010086474 Oak Ridge National Lab., Physics Div., TN USA

**Workshop on Molecule Assisted Recombination and Other Processes in Fusion Divertor Plasmas, Summary Report
Semiannual Report**

Janev, R. K.; Schultz, D. R.; Nov. 2000; 30p; In English, 8-9 Sep. 2000

Report No.(s): DE2001-769290; ORNL/TM-2000/313; No Copyright; Avail: Department of Energy Information Bridge

A brief proceedings of the two-day Workshop on Molecule Assisted Recombination and Other Processes in Fusion Divertor Plasmas, organized by the ORNL Controlled Fusion Atomic Data Center on September 8-9, 2000, is presented. The conclusions and recommendations of the workshop regarding the topics discussed and the collaboration of the U.S. fusion research and atomic physics communities are also summarized.

NTIS

Atomic Physics; Conferences; Controlled Fusion; Plasmas (Physics); Divertors (Fusion Reactors)

20010086955 Princeton Univ., Plasma Physics Lab., NJ USA

Energetic Particle Effects Can Explain the Low Frequency of Alfven Modes in the DIII-D Tokamak

Gorelenkov, N. N.; Heidbrink, W. W.; Jan. 2001; 22p; In English

Report No.(s): DE2001-775570; PPPL-3539; No Copyright; Avail: Department of Energy Information Bridge

During beam injection in the DIII-D tokamak, modes with lower frequencies than expected for toroidicity Alfven eigenmodes (TAE) are often observed. We present the analysis of one of these 'beta-induced Alfven eigenmodes' (BAE) with a high-n stability code HINST that includes the effect of the energetic ions on the mode frequency. It shows that the 'BAE' could be the theoretically predicted resonant-TAE (RTAE), which is also called an energetic-particle modes (EPM).

NTIS

Toroidal Plasmas; Tokamak Devices; Magnetohydrodynamic Waves; Alpha Particles; Plasma Physics

20010086956 Princeton Univ., Plasma Physics Lab., NJ USA

Recent Advances in the Design of Quasi-Axisymmetric Stellarator Plasma Configurations

Reiman, A.; Ku, L.; Monticello, D.; Hirschman, S.; Hudson, S.; Jan. 2001; 38p; In English

Report No.(s): DE2001-775569; PPPL-3538; No Copyright; Avail: Department of Energy Information Bridge

Strategies for the improvement of quasi-axisymmetric stellarator configurations are explored. Calculations of equilibrium flux surfaces for candidate configurations are also presented. One optimization strategy is found to generate configurations with improved neoclassical confinement, simpler coils with lower current density, and improved flux surface quality relative to previous designs. The flux surface calculations find significant differences in the extent of islands and stochastic regions between candidate configurations. (These calculations do not incorporate the predicted beneficial effects of perturbed bootstrap currents.) A method is demonstrated for removing low order islands from candidate configurations by relatively small modifications of the configuration. One configuration is identified as having particularly desirable properties for a proposed experiment.

NTIS

Stellarators; Plasmas (Physics); Plasma Physics

20010086957 Princeton Univ., Plasma Physics Lab., NJ USA

Nonlinear Charge and Current Neutralization of an Ion Beam Pulse in a Pre-Formed Plasma

Kaganovich, I. D.; Shvets, G.; Startsev, E.; Davidson, R. C.; Jan. 2001; 36p; In English

Report No.(s): DE2001-775538; PPPL-3537; No Copyright; Avail: Department of Energy Information Bridge

The propagation of a high-current finite-length ion beam in a cold pre-formed plasma is investigated. The outcome of the calculation is the quantitative prediction of the degree of charge and current neutralization of the ion beam pulse by the background plasma. The electric and magnetic fields generated by the ion beam are studied analytically for the nonlinear case where the plasma density is comparable in size with the beam density.

NTIS

Electric Charge; Ion Beams; Plasma Physics; Beam Neutralization; Cold Plasmas

20010086958 Princeton Univ., Plasma Physics Lab., NJ USA

Fluid-Kinetic Hybrid Electron Model for Electromagnetic Simulations

Lin, Z.; Chen, L.; Jan. 2001; 12p; In English

Report No.(s): DE2001-775535; PPPL-3536; No Copyright; Avail: Department of Energy Information Bridge

Magnetic fluctuations in magnetized plasmas have been shown in linear theories to be key ingredients in micro-instabilities (1), drift-Alfven wave instabilities (2), and magnetohydrodynamic instabilities such as toroidal Alfven eigenmodes (3), energetic

particle modes (4) as well as the generation of magnetic pulsations in magnetospheres (5). Nonlinear kinetic study of these electromagnetic fluctuations, meanwhile, is hindered by the difficulty of treating the dynamics of electrons whose characteristic frequency is much faster than that of the low frequency modes of interest. Specially, the existence of high frequency modes and the electron Courant condition (6) place stringent, unnecessary numerical constraints in noets of the fully kinetic model.

NTIS

Simulation; Magnetohydrodynamic Waves; Plasmas (Physics); Kinetic Equations; Electrons; Plasma Physics

20010087676 NASA Ames Research Center, Moffett Field, CA USA

MHD Energy Bypass Scramjet Performance with Real Gas Effects

Park, Chul, Eloret Corp., USA; Mehta, Unmeel B., NASA Ames Research Center, USA; Bogdanoff, David W., Eloret Corp., USA; [2000]; 34p; In English

Contract(s)/Grant(s): NAS2-99092; RTOP 713-74-00; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The theoretical performance of a scramjet propulsion system incorporating an magneto-hydro-dynamic (MHD) energy bypass scheme is calculated. The one-dimensional analysis developed earlier, in which the theoretical performance is calculated neglecting skin friction and using a sudden-freezing approximation for the nozzle flow, is modified to incorporate the method of Van Driest for turbulent skin friction and a finite-rate chemistry calculation in the nozzle. Unlike in the earlier design, in which four ramp compressions occurred in the pitch plane, in the present design the first two ramp compressions occur in the pitch plane and the next two compressions occur in the yaw plane. The results for the simplified design of a spaceliner show that (1) the present design produces higher specific impulses than the earlier design, (2) skin friction substantially reduces thrust and specific impulse, and (3) the specific impulse of the MHD-bypass system is still better than the non-MHD system and typical rocket over a narrow region of flight speeds and design parameters. Results suggest that the energy management with MHD principles offers the possibility of improving the performance of the scramjet. The technical issues needing further studies are identified.

Author

Magnetohydrodynamics; Nozzle Flow; Propulsion System Performance; Specific Impulse; Supersonic Combustion Ramjet Engines; Skin Friction; Bypasses; Design Analysis; Rocket Engine Design

20010089315 NASA Ames Research Center, Moffett Field, CA USA

Improvement of Scramjet Performance-Experimental Demonstration of MHD Acceleration

Bogdanoff, David W., Eloret Corp., USA; Park, Chul, NASA Ames Research Center, USA; Mehta, Unmeel B., NASA Ames Research Center, USA; [2001]; 4p; In English; 15th International Symposium on Airbreathing Engines, 2-7 Sep. 2001, Bangalore, India

Contract(s)/Grant(s): NAS2-99092; RTOP 713-74-00; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

One of the critical technologies of MHD (Magnetohydrodynamics) bypass scramjet propulsion for space launch and cruise vehicles is MHD acceleration. An experiment in a shock tunnel is described in which MHD acceleration is investigated experimentally. The objectives, the methods used and the preliminary results are described in this paper.

Derived from text

Shock Tunnels; Supersonic Combustion Ramjet Engines; Plasma Acceleration; Magnetohydrodynamics; Wind Tunnel Tests; High Temperature Air; Nozzle Flow; Supersonic Flow; Gas Dynamics; Bypasses; Supersonic Nozzles

76

SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

20010083363 Computer Sciences Corp., Moffett Field, CA USA

Computational Nanotechnology of Materials, Devices, and Machines: Carbon Nanotubes

Srivastava, Deepak, Computer Sciences Corp., USA; [2000]; 9p; In English; Training Workshop on Nano-Biotechnology, 14-15 Jun. 2000, Hampton, VA, USA

Contract(s)/Grant(s): NASA Order A-61812-D; DTTS59-99-D-00437; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The mechanics and chemistry of carbon nanotubes have relevance for their numerous electronic applications. Mechanical deformations such as bending and twisting affect the nanotube's conductive properties, and at the same time they possess high strength and elasticity. Two principal techniques were utilized including the analysis of large scale classical molecular dynamics

on a shared memory architecture machine and a quantum molecular dynamics methodology. In carbon based electronics, nanotubes are used as molecular wires with topological defects which are mediated through various means. Nanotubes can be connected to form junctions.

CASI

Carbon; Nanotechnology; Nanotubes

20010084297 Argonne National Lab., IL USA

Microstructural Development and Superconducting Properties of BaO₂-added Bi₂SR₂CaCu₂O(8+x)

Koritala, R. E.; Trociewitz, U. P.; Bacaltchuk, C.; Schwartz, J.; Sahm, P. R.; Sep. 2000; 10p; In English

Report No.(s): DE2001-768611; ANL/ET/CP-103314; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Investigations on the effects of Ba additions in BaO₂ superconductors are focussed on compositional, microstructural, and magnetization studies. In previous studies, we showed that BaO₂ reacts with BaO₂12 to form second phases. Zero field and in-field transport properties in Ag-cktd BaO₂ added BaO₂212 tapes had been improved at 4.2 K. SEM micrographs, pole figures, and transport critical currents versus magnetic field orientation suggest that BaO₂ has a strong influence on the microstructural properties. Magnetization studies revealed that BaO₂ does not affect the pinning properties of optimally added BaO₂. to estimate the potential of BaO₂ additions in creating possible pinning sites, TEM investigations were carried out focussing on sub-micrometer inclusions and growth defects in the superconducting phase.

NTIS

Microstructure; Transport Properties; Magnetic Fields; Barium Oxides; Superconductivity

20010085336 MRJ, Inc., USA

Single Particle Transport Through Carbon Nanotube Wires: Effect of Defects and Polyhedral Cap

Anantram, M. P., NASA Ames Research Center, USA; Govidan, T. R., NASA Ames Research Center, USA; [1999]; 13p; In English; NANOTUBE-99 Workshop: Science and Application of Nanotube, Jul. 1999, East Lansing, MI, USA

Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The ability to manipulate carbon nanotubes with increasing precision has enabled a large number of successful electron transport experiments. These studies have primarily focussed on characterizing transport through both metallic and semiconducting wires. Tans et al. demonstrated ballistic transport in single-wall nanotubes for the first time, although the experimental configuration incurred large contact resistance. Subsequently, methods of producing low contact resistances have been developed and two terminal conductances smaller than 50 k-ohms have been repeatably demonstrated in single-wall and multi-wall nanotubes. In multi-wall nanotubes, Frank et al. demonstrated a resistance of approximately $h/2e(\exp 2)$ in a configuration where the outermost layer made contact to a liquid metal. This was followed by the work of de Pablo et al. where a resistance of $h(\text{bar})/27e(\exp 2)$ (approximately 478 ohms) was measured in a configuration where electrical contact was made to many layers of a multi-wall nanotube. Frank et al. and Pablo et al. note that each conducting layer contributes a conductance of only $2e(\exp 2)/h$, instead of the $4e(\exp 2)/h$ that a single particle mode counting picture yields. These small resistances have been obtained in microns long nanotubes, making them the best conducting molecular wires to date. The large conductance of nanotube wires stems from the fact that the crossing bands of nanotubes are robust to defect scattering.

Derived from text

Nanotubes; Wire; Electron Transfer; Computerized Simulation; Defects

20010085339 NASA Ames Research Center, Moffett Field, CA USA

Anisotropic Nanomechanics of Boron Nitride Nanotubes: Nanostructured "Skin" Effect

Srivastava, Deepak, NASA Ames Research Center, USA; Menon, Madhu, Kentucky Univ., USA; Cho, KyeongJae, Stanford Univ., USA; Jul. 24, 2000; 15p; In English

Contract(s)/Grant(s): DTT59-99-D-00437; NSF OSR-99-07463; NSF DMR-98-09686; NSF OSR-99-63231; NASA Order A-61812-D; NSF OSR-99-63232; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The stiffness and plasticity of boron nitride nanotubes are investigated using generalized tight-binding molecular dynamics and ab-initio total energy methods. Due to boron-nitride BN bond buckling effects, compressed zigzag BN nanotubes are found to undergo novel anisotropic strain release followed by anisotropic plastic buckling. The strain is preferentially released towards N atoms in the rotated BN bonds. The tubes buckle anisotropically towards only one end when uniaxially compressed from both.

A "skin-effect" model of smart nanocomposite materials is proposed which will localize the structural damage towards the 'skin' or surface side of the material.

Author

Boron Nitrides; Nanotubes; Plastic Properties; Smart Materials; Joints (Junctions)

20010085365 Vanderbilt Univ., Dept. of Physics and Astronomy, Nashville, TN USA

A Novel Synthesis Technique for Semiconductor Thin Film and Heterostructure Formation *Final Report, 1 Aug. 1998-31 Dec. 2000*

Feldman, L. C., Vanderbilt Univ., USA; Jun. 2001; 7p; In English

Contract(s)/Grant(s): DAAG55-98-1-0449

Report No.(s): AD-A392537; ARO-37585.3-PH; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

No abstract.

DTIC

Semiconducting Films; Thin Films; Hydrogen; Relaxation Time; Heterojunctions; Metal Oxide Semiconductors

20010085947 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Ground States of the One Dimensional Falicov-Kimball Model

Miracle-Sole, S.; May 2001; 34p; In English; Portions of this document are not fully legible

Report No.(s): PB2001-106897; IHES/P/01/20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

No abstract available.

NTIS

Ground State; Models

20010086192 Argonne National Lab., Energy Technology Div., IL USA

Fabrication of Yb123 Tapes

Athur, S.; Balachandran, U.; Salama, K.; Sep. 2000; 10p; In English

Report No.(s): DE2001-768587; ANL/ET/CP-102688; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

While Bi-2223 tapes have been the workhorses of the superconductor industry, their poor performance in applied magnetic fields restrict their use to below 30 K. Meltprocessing of Ag-clad Yb-123 PIT tapes offers a simple and scalable technique for fabricating long-length HTS conductors capable of being used at 77 K. Under reduced oxygen partial pressure, the peritectic temperature of Yb-123 is below the melting point of Ag, and this facilitates the adaptation of melt-texturing methods for fabricating these tapes. The effect of melt-processing temperature on current density was also explored; a temperature of 965 degrees C yielded optimal critical current values. The critical current density achieved at 4.2 K was 20,000 Alcm², corresponding to a critical current of 52 A. Based on the above results, an optimal processing zone for melt-processing of Ag-clad Yb-123 tapes was determined. These results hold promise for melt-processing of Ag-clad Yb-123 tapes as an alternative to Bi-2223 PIT technology.

NTIS

Ytterbium Isotopes; Fabrication; Superconductors (Materials)

20010086193 Argonne National Lab., Materials Science Div., IL USA

Spin Spring Behavior in Exchange Coupled Soft and High-Coercivity Hard Ferromagnets

Shull, R. D.; Shapiro, A. J.; Gornakov, V. S.; Nikitenko, V. I.; Jiang, J. S.; Dec. 2000; 10p; In English

Report No.(s): DE2001-768586; ANL/MSD/CP-102613; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The magnetization reversal processes in an epitaxial Fe/Sm₂Co₇ structure were investigated using the magneto-optical indicator film technique. The dependence of the magnitude and the orientation of the structure average magnetization have been studied on both cycling and rotating the external magnetic field. It was discovered that the magnetization reversal of the soft ferromagnet can proceed by formation of not only one-dimensional, but also two-dimensional, exchange spin springs. Experimental data is compared with a theoretical estimation of the rotational hysteresis loop for a spin system containing a one-dimensional exchange spring.

NTIS

Ferromagnetic Films; Spin Exchange; Springs (Elastic)

20010086404 Argonne National Lab., Materials Science and Technology Div., IL USA

Magnetic Phase Diagram of Layered Manganites in the Highly Doped Regime

Mitchell, J. F.; Ling, C. D.; Milburn, J. E.; Argyriou, D. N.; Berger, A.; 2001; 22p; In English

Report No.(s): DE2001-768581; ANL/MSD/CP-102421; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The naturally layered colossal magnetoresistive (CMR) manganites $\text{La}(\text{sub}2-2x)\text{SR}(\text{sub}1+2x)\text{Mn}(\text{sub}2)\text{O}(\text{sub}7)$ exhibit an extremely varied range of magnetic and electronic behavior over a very narrow composition range between $x=0.3$ and $x=0.5$. The successful synthesis in our laboratories of compounds with nominally greater than 50 percent Mn (sup 4+) concentration has now allowed the study of this heretofore unexplored region of the phase diagram. Here we present detailed neutron diffraction measurements of these compounds with doping levels 0.5 less than x less than 1.0. As predicted by simple theories, the type-A layered antiferromagnetic (AF) structure is found at x approximately 0.5 and the type-G 'rocksalt' AF structure at x equals 1.0. Between these two extremes is found a C-type structure (ferromagnetic rods parallel to b coupled antiferromagnetically to all neighboring rods) stabilized by orbital ordering of $y(\text{sup}2)$ states. Also in this Mn (sup 4+) -rich regime is found a region in which no long-range magnetic order is observed. We discuss how semi-empirical models can explain the variety of magnetic structures and how structural trends as a function of doping corroborate the unifying notion of a shift from in-plane to axial orbital occupation as the Mn (sup 4+) I concentration is decreased.

NTIS

Phase Diagrams; Magnetic Properties; Additives; Magnetic Field Configurations; Doped Crystals

20010086584 Oak Ridge National Lab., TN USA

Method to Improve Activation of Implanted Dopants in SiC

Holland, O. W.; Thomas, D. K.; 2001; 14p; In English

Report No.(s): PB2001-106596; No Copyright; Avail: National Technical Information Service (NTIS)

Implantation of dopant ions in SiC has evolved according to the assumption that the best electrical results (i.e., carrier concentrations and mobility) is achieved by using the highest possible processing temperature. This includes implantation at more than 600DGC followed by furnace annealing at temperatures as high as 1750 degrees C. Despite such aggressive and extreme processing, implantation suffers because of poor dopant activation, typically ranging between less than 2%-50% with p-type dopants represented in the lower portion of this range and n-types in the upper. Additionally, high-temperature processing can lead to several problems including changes in the stoichiometry and topography of the surface, as well as degradation of the electrical properties of devices. A novel approach for increasing activation of implanted dopants in SiC and lowering the activation temperature will be discussed. This approach utilizes the manipulation of the ion-induced damage to enhance activation of implanted dopants. It will be shown that nearly amorphous layers containing a small amount of residual crystallinity can be recrystallized at temperatures below 900 degrees C with little residual damage. It will be shown that recrystallization traps a high fraction of the implanted dopant residing within the amorphous phase (prior to annealing) onto substitutional sites within the SiC lattice.

NTIS

Ions; Silicon Carbides; Implantation; Electrical Properties; Amorphous Materials

20010086629 Argonne National Lab., Materials Science Div., IL USA

Stability of Coupling in Exchange Spring and Exchange Bias Systems

Jiang, J. S.; Inomata, A.; You, C. Y.; Pearson, J. E.; Bader, S. D.; 2001; 18p; In English

Report No.(s): DE2001-768585; ANL/MSD/CP-102612; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We have studied the magnetic stability in exchange bias and exchange spring systems prepared via epitaxial sputter deposition. The two interracial exchange coupled systems, Fe/Cr(2 11) double superlattices consisting of a ferromagnetic and an antiferromagnetic Fe/Cr superlattice that are exchange coupled through a Cr spacer, and Sin-Co/Fe exchange-spring bilayer structures with ferromagnetically coupled hard Sin-Co layer and soft Fe layer, were epitaxially grown on suitably prepared Cr buffer layers to give rise to different microstructure and magnetic anisotropy. The magnetic stability investigated using the magneto-optic Kerr effect during repeated reversal of the soft was layer magnetization by field cycling up to 107 times. For uniaxial Fe/Cr exchange biased double superlattices and exchange spring bilayers with uniaxial Sin-Co, small but rapid initial decay in the exchange bias field H_E and in the remanent magnetization is observed. However, the exchange spring bilayers with biaxial and random in-plane anisotropy in the Sin-Co layer shows gradual decay in H_E and without large reduction of the

magnetization. The different decay behaviors are attributed to the different microstructure and spin configuration of the pinning layers.

NTIS

Stability; Magnetization; Coupling; Microstructure; Antiferromagnetism

20010086630 Argonne National Lab., IL USA

Evidence for Competing Order Parameters in the Paramagnetic Phase of Layered Manganites

Berger, A.; Mitchell, J. F.; Miller, D. J.; Bader, S. D.; 2001; 26p; In English

Report No.(s): DE2001-768583; ANL/MSD/CP-102424; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The magnetic field and temperature dependence of the magnetic susceptibility and magnetization is studied for the ferromagnetic layered manganites in the composition range $x = 0.32$ - 0.40 . In the paramagnetic phase, the susceptibility exhibits an anomalous maximum at an intermediate magnetic field value. The size of this field-induced susceptibility enhancement increases dramatically with x from 10% for $x = 0.32$ to 160% for $x = 0.40$. The temperature dependence of the effect shows a maximum at T approximately $1.1 T_c$ for all x . Quantitative analysis in terms of the Landau theory of phase transitions enables us to identify a distortion of the free energy F in the paramagnetic phase that is associated with the susceptibility anomaly. This free energy distortion corresponds to a magnetic system that approaches a first order magnetic phase transition as the temperature is lowered towards T_c . Such a behavior is indicative of a second, competing order parameter, which is identified as the recently observed charge density wave. In the immediate vicinity of T_c , the anomaly disappears and the system seems to undergo a more conventional second order paramagnetic-ferromagnetic phase transition.

NTIS

Paramagnetism; Magnetic Permeability; Temperature Dependence; Density (Number/Volume)

20010086633 Argonne National Lab., Materials Science Div., IL USA

Growth and Magnetic Properties of Ultrathin Fe on Pd(110)

Cuenya, B. R.; Pearson, J.; Yu, C.; Li, D.; Bader, S. D.; 2001; 22p; In English

Report No.(s): DE2001-768577; ANL/MSD/CP-102063; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We have investigated the growth and magnetic properties of O-3ML (monolayer) Fe on stepped Pd(110) with reflection high-energy electron diffraction (RHEED), low energy electron diffraction (LEED) and the surface magneto-optic Kerr effect (SMOKE) in order to relate the morphology, structure and magnetic properties in a low-dimensional system. The Fe films, grown at 340 K, are smooth and pseudomorphic up to 1.5 ML, where three-dimensional growth and lateral lattice relaxation ensues. The in-plane row spacing along the (110) decreases by -5-6 % at 3 ML. RHEED oscillations with 1-ML period are observed in the (1,0), (2,0) and the center of the (0,0) streak intensity. The tail of the (0,0) streak at low exit angle, however, has a 0.5-ML period oscillation, which suggests step decoration growth. Submonolayer Fe films remain ferromagnetic above -0.3 ML. The magnetic easy axis is initially perpendicular to the surface and is in-plane for Fe thickness is greater than 1.5 ML. Between 0.9- 1.2 ML, there appear to be mixed magnetic phases as indicated by an increase in coercivity.

NTIS

Iron; Magnetization; Magnetic Properties; Palladium; Crystal Growth

20010087030 NASA Ames Research Center, Moffett Field, CA USA

High Coverages of Hydrogen on a (10,0) Carbon Nanotube

Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; [2001]; 17p; In English

Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The binding energy of H to a (10,0) carbon nanotube is calculated at 24, 50, and 100% coverage. Several different bonding configurations are considered for the 50% coverage case. Using the ONIOM (our own n-layered integrated molecular orbital and molecular mechanics) approach, the average C-H bond energy for the most stable 50% coverage and for the 100% coverage are 57.3 and 38.6 kcal/mol, respectively. Considering the size of the bond energy of H₂, these values suggest that it will be difficult to achieve 100% atomic H coverage on a (10,0) nanotube.

Author

Binding Energy; Bonding; Nanotubes; Chemical Bonds

20010089138 NASA Ames Research Center, Moffett Field, CA USA

Nano-Electronics and Bio-Electronics

Srivastava, Deepak, NASA Ames Research Center, USA; [2001]; 1p; In English; Molecular BioElectronic and Hybrid Electronic Systems Conference, 19-20 Oct. 2001, Boston, MA, USA

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Viewgraph presentation on Nano-Electronics and Bio-Electronics is discussed. Topics discussed include: NASA Ames nanotechnology program, Potential Carbon Nanotube (CNT) application, CNT synthesis, Computational Nanotechnology, and protein nanotubes.

Derived from text

Nanotechnology; Nanotubes; Nanostructures (Devices); Carbon; Synthesis (Chemistry); Bioinstrumentation; Quantum Electronics

20010089242 Argonne National Lab., Materials Science Div., IL USA

Changes in Electron-Phonon Coupling Across a Bulk Phase Transition in Copolymer Films of Vinylidene Fluoride (70%) with Trifluoroethylene (30%)

Borca, C. N.; Adenwalla, S.; Choi, J.; Robertson, L.; You, H.; 2001; 20p; In English

Report No.(s): DE2001-768608; ANL/MSD/CP-103305; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We present evidence for a change in electron - phonon coupling across a bulk phase transition. Below the lattice stiffening transition at around 160 K, there is a change in the diffracted peak width observed by neutron and X-ray scattering techniques. Also, the electronic band structure of the copolymer is shifting in binding energy below 160 K, decreasing the density of states near the Fermi level. The value of the effective Debye temperature above the transition temperature is approximately 50 K, while below 160 K, the value of the Debye parameter is 245 K. We postulate that the coupling between electrons and phonons results in a static distortion of the lattice (below 160 K), and this distortion 'melts' above 160 K.

NTIS

Copolymers; Electronic Structure; Fluorides; Neutron Scattering; Phase Transformations; Vinyl Copolymers

20010089244 Argonne National Lab., Materials Science Div., IL USA

Grain Boundary Transport Properties in YBa₂Cu₃O_x Coated Conductors

Bershuys, P.; Miller, D. J.; Kim, D. H.; Gray, K. E.; Feenstra, R.; 2001; 10p; In English

Report No.(s): DE2001-768600; ANL/MSD/CP-103218; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Critical current data obtained as a function of magnetic field on an isolated grain boundary (GB) of a coated conductor and two other types of bicrystal GBs of YBa₂Cu₃O, show a peak in the critical current and an unusual hysteresis. These results provide support for a new mechanism for enhanced GB critical currents, arising from interactions of GB vortices with pinned Abrikosov vortices in the banks of a GB, as suggested by Gurevich and Cooley. A substantial fraction of the enhancement, which can exceed a factor of ten, also occurs upon surpassing the critical current of the grains after zero field cooling. A bulk GB and thin film GBs show qualitatively identical results.

NTIS

Grain Boundaries; Transport Properties; High Temperature Superconductors; Coatings; Conductors

20010089262 Computer Sciences Corp., Moffett Field, CA USA

Modeling Ballistic Current Flow in Carbon Nanotube Wires

Anantram, M. P., Computer Sciences Corp., USA; [2001]; 6p; In English; Nanoscience Colloquium, 18-20 May 2001, Moffett Field, CA, USA

Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Experiments have shown carbon nanotubes (CNT) to be almost perfect conductors at small applied biases. The features of the CNT band structure, large velocity of the crossing subbands and the small number of modes that an electron close to the band center / Fermi energy can scatter into, are the reasons for the near perfect small bias conductance. We show that the CNT band structure does not help at large applied biases - electrons injected into the non crossing subbands can either be Bragg reflected or undergo Zener-type tunneling. This limits the current carrying capacity of CNT. We point out that the current carrying capacity of semiconductor quantum wires in the ballistic limit is different, owing to its band structure. The second aspect addressed is the relationship of nanotube chirality in determining the physics of metal-nanotube coupling. We show that a metallic-zigzag

nanotube couples better than an armchair nanotube to a metal contact. This arises because in the case of armchair nanotubes, while the π band couples well, the π^* band does not couple well to the metal. In the case of zigzag nanotube both crossing modes couple reasonably well to the metal. Many factors such as the role of curvature, strain and defects will play a role in determining the suitability of nanotubes as nanowires. From the limited view point of metal-nanotube coupling, we feel that metallic-zigzag nanotubes are preferable to armchair nanotubes.

Author

Carbon; Nanotubes; Coupling; Quantum Wires; Nanostructures (Devices); Band Structure of Solids; Conduction Bands; Electron Transitions; Electric Current; Shapes; Mathematical Models; Metals

77

PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.

20010083368 Helsinki Univ. of Technology, Materials Physics Lab., Espoo Finland

Orbital and Spin Kondo Effects in a Double Quantum Dot

Pohjola, T.; Schoeller, H.; Schoen, G.; 2000; 24p; In English

Report No.(s): PB2001-106868; TKK-F-A802; Copyright; Avail: Issuing Activity

Motivated by recent experiments, in which the Kondo effect has been observed for the first time in a double quantum-dot structure, the authors study electron transport through a system consisting of two ultrasmall, capacitively-coupled dots with large level spacing and charging energy. Due to strong interdot Coulomb correlations, the Kondo effect has two possible sources, the spin and orbital degeneracies, and it is maximized when both occur simultaneously. The large number of tunable parameters allows a range of manipulations of the Kondo physics - in particular, the Kondo effect in each dot is sensitive to changes in the state of the other dot. For a thorough account of the system dynamics, the linear and nonlinear conductance is calculated in perturbative and non-perturbative approaches. In addition, the temperature dependence of the resonant peak heights is evaluated in the framework of a renormalization group analysis.

NTIS

Kondo Effect; Quantum Dots; Electron Transfer; Electron Orbitals

20010083949 Brookhaven National Lab., Upton, NY USA

Power Corrections in Eikonal Cross Sections

Laenen, E.; Sterman, G.; Vogelsang, W.; Oct. 17, 2000; 8p; In English

Report No.(s): DE2001-773957; BNL-67841; No Copyright; Avail: Department of Energy Information Bridge

We discuss power corrections associated with the behavior of the perturbative running coupling in the eikonal approximation to Drell-Yan and other annihilation cross sections in hadron-hadron scattering. General properties of the eikonal approximation imply that only even powers of the energy scale are necessary.

NTIS

Correction; Cross Sections; Eikonal Equation; Scattering; Hadrons; Approximation

20010084321 Naval Academy, Annapolis, MD USA

Development of an Inverse Ultrasonic Radiative Transfer Technique

Smith, Kevin D.; May 07, 2001; 39p; In English

Report No.(s): AD-A392458; USNA-1531-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The focus of this research is the development of an inverse ultrasonic radiative transfer technique for materials characterization. The technique characterizes multiple scattering materials by estimating the way a typical scatterer redirects ultrasonic intensity into new directions. The way in which a scatterer redistributes ultrasonic intensity is described by the shape of its phase function. The developed technique relies on the gathering of backscattered ultrasonic intensity for the purpose of determining the Legendre coefficients of the phase function. This determination is achieved through an approximate inverse solution of the radiative transfer equation (RTE).

DTIC

Radiative Transfer; Scattering

20010088235 Los Alamos National Lab., NM USA

Quantum Mechanics Without Statistical Postulates

Geiger, H.; Obermair, G.; Helm, C.; December 2000; 12p; In English

Report No.(s): DE2001-768180; LA-UR-00-3799; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Bohmian formulation of quantum mechanics describes the measurement process in an intuitive way without a reduction postulate. Due to the chaotic motion of the hidden classical particle all statistical features of quantum mechanics during a sequence of repeated measurements can be derived in the framework of a deterministic single system theory.

NTIS

Statistical Mechanics; Systems Analysis; Quantum Mechanics

80

SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula.

20010082962 NASA Goddard Space Flight Center, Greenbelt, MD USA

Materials Presented at the MU-SPIN Tenth Annual Users' Conference

Harrington, James L., Jr., NASA Goddard Space Flight Center, USA; Shukla, Pooja, ADNET Systems, Inc., USA; December 2000; 614p; In English; MU-SPIN Tenth Annual Users' Conference, 11-15 Sep. 2000, Atlanta, GA, USA; Sponsored by NASA, USA; See also 20010082963 through 20010082971

Report No.(s): NASA/CP-2000-209975; Rept-2000-00755-0; NAS 1.55:209975; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

The Minority University-Space Interdisciplinary Network (MU-SPIN) Program and NASA's Minority University Research and Education Division (MURED) both reached their 10th anniversaries. In honor of this occasion, the 2000 Annual Users' Conference held at Morris Brown College in Atlanta, Georgia, September 11-15, 2000, was the first to be jointly hosted by MU-SPIN and MURED. With the theme 'Celebrating Our Tenth Year With Our Eyes on the Prize,' the conference provided a national forum for showcasing successful MU-SPIN and MURED Program (MUREP) experiences to enhance faculty/student development in areas of scientific and technical research and education.

Author

Conferences; Education; Public Relations

20010082963 NASA Goddard Space Flight Center, Greenbelt, MD USA

Conference Summary

Harrington, James L., Jr., NASA Goddard Space Flight Center, USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 1-6; In English; See also 20010082962; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Celebrations and special events were in order this year as the Minority University-Space Interdisciplinary Network (MU-SPIN) Program and NASA's Minority University Research and Education Division (MURED) both reached their 10th anniversaries. In honor of this occasion, the 2000 Annual Users' Conference held at Morris Brown College (MBC) in Atlanta, Georgia, September 11-15, 2000, was the first to be jointly hosted by MU-SPIN and MURED. It was particularly fitting that this anniversary should fall in the year 2000. The start of the new millennium propelled us to push bold new ideas and renew our commitment to minority university participation in all areas of NASA. With the theme 'Celebrating Our Tenth Year With Our Eyes on the Prize,' the conference provided a national forum for showcasing successful MU-SPIN and MURED Program (MUREP) experiences to enhance faculty/student development in areas of scientific and technical research and education. Our NASA-relevant conference agenda resulted in a record-breaking 220 registered attendees. Using feedback from past participants, we designed a track of student activities closely tailored to their interests. The resulting showcase of technical assistance and best practices set a new standard for our conferences in the years to come. This year's poster session was our largest ever, with over 50 presentations from students, faculty, and teachers. Posters covered a broad range of NASA activities from 'A Study of the Spiral Galaxy M101' to 'Network Cabling Characteristics.'

Derived from text

Education; Research; Conferences

20010082964 NASA Goddard Space Flight Center, Greenbelt, MD USA

MU-SPIN Project Update

Harrington, James L., Jr., NASA Goddard Space Flight Center, USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 57-103; In English; See also 20010082962; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The Minority University Space Interdisciplinary (MUSPIN) Network project is a comprehensive outreach and education initiative that focuses on the transfer of advanced computer networking technologies and relevant science to Historically Black Colleges and Universities (HBCU's) and Other Minority Universities (OMU's) for supporting multi-disciplinary education research.

Author

Education; Technology Transfer; Astronomy

20010082965 Jackson State Univ., Jackson, MS USA

MU-SPIN Showcase

Brown, Willie, Jackson State Univ., USA; Gil, Joan, Canutillo Independent School District, USA; Wakim, Nagi, Bowie State Univ., USA; Okoh, Fred, Morris Brown Coll., USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 105-142; In English; See also 20010082962; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This viewgraph presentation gives an overview of the information technology developed at Jackson State University. Details are given on access services (connectivity at JSU and outside world), shared systems (Student Information Systems and touch-screen kiosks), and support systems (personnel, hardware and software).

CASI

Information Systems; Support Systems; Computer Systems Programs

20010082966 NASA Goddard Space Flight Center, Greenbelt, MD USA

NASA Earth Science Update with Information Science Technology

Halem, Milton, NASA Goddard Space Flight Center, USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 143-200; In English; See also 20010082962; No Copyright; Avail: CASI; A04, Hardcopy; A06, Microfiche

This viewgraph presentation gives an overview of NASA earth science updates with information science technology. Details are given on NASA/Earth Science Enterprise (ESE)/Goddard Space Flight Center strategic plans, ESE missions and flight programs, roles of information science, ESE goals related to the Minority University-Space Interdisciplinary Network, and future plans.

CASI

Earth Sciences; Information Systems; Mission Planning; Space Missions

20010082967 NASA Goddard Space Flight Center, Greenbelt, MD USA

Space Science Update: Space Science Opportunity for the Visionary

Barrowman, Jim, NASA Goddard Space Flight Center, USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 201-286; In English; See also 20010082962; No Copyright; Avail: CASI; A05, Hardcopy; A06, Microfiche

NASA's Space Science Enterprise Mission tries to answer the following questions: (1) How did the universe begin and evolve? How did we get here? How does our environment in space affect us? Where are we going? Are we alone? NASA space science seeks to explore the Solar System, conduct an astronomical search for planetary systems and the origin and distribution of life in the universe, understand the structure and evolution of the universe, and better understand the Sun-Earth connection.

Derived from text

Planetary Systems; Solar System; Space Missions; Universe; Space Exploration

20010082968 International Telecommunication Services, USA

Linkages 2001

Phifer, Mabel, International Telecommunication Services, USA; Phifer-McGee, Kimberly, Florida Agricultural and Mechanical Univ., USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 289-314; In English; See also 20010082962; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The goals of the project this viewgraph presentation summarizes include the following: (1) Build collaborative linkages to maximize the utilization of existing technologies at HBCUs; (2) Enhance the quality of both teaching and learning; (3) Provide

access to NASA scholars, researchers, and lecturers for HBCU students and faculty; and (4) Create new revenue streams for the universities through the use of telecommunication technologies.

Derived from text

Education; Technology Utilization

20010082969 City Coll. of the City Univ. of New York, Inst. for Ultrafast Spectroscopy and Lasers, NY USA

Detection of Objects Hidden in Highly Scattering Media Using Time-Gated Imaging Methods

Galland, Pierre A., City Coll. of the City Univ. of New York, USA; Wang, L., City Coll. of the City Univ. of New York, USA; Liang, X., City Coll. of the City Univ. of New York, USA; Ho, P. P., City Coll. of the City Univ. of New York, USA; Alfano, R. R., City Coll. of the City Univ. of New York, USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 360-363; In English; See also 20010082962; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Non-intrusive and non-invasive optical imaging techniques has generated great interest among researchers for their potential applications to biological study, device characterization, surface defect detection, and jet fuel dynamics. Non-linear optical parametric amplification gate (NLOPG) has been used to detect back-scattered images of objects hidden in diluted Intralipid solutions. To directly detect objects hidden in highly scattering media, the diffusive component of light needs to be sorted out from early arrived ballistic and snake photons. In an optical imaging system, images are collected in transmission or back-scattered geometry. The early arrival photons in the transmission approach, always carry the direct information of the hidden object embedded in the turbid medium. In the back-scattered approach, the result is not so forth coming. In the presence of a scattering host, the first arrival photons in back-scattered approach will be directly photons from the host material. In the presentation, NLOPG was applied to acquire time resolved back-scattered images under the phase matching condition. A time-gated amplified signal was obtained through this NLOPG process. The system's gain was approximately 100 times. The time-gate was achieved through phase matching condition where only coherent photons retain their phase. As a result, the diffusive photons, which were the primary contributor to the background, were removed. With a large dynamic range and high resolution, time-gated early light imaging has the potential for improving rocket/aircraft design by determining jets shape and particle sizes. Refinements to these techniques may enable drop size measurements in the highly scattering, optically dense region of multi-element rocket injectors. These types of measurements should greatly enhance the design of stable, and higher performing rocket engines.

Author

Imaging Techniques; Photons; Backscattering

20010082970 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Getting Involved with the Discovery Program

Asplund, Shari, Jet Propulsion Lab., California Inst. of Tech., USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 367-428; In English; See also 20010082962; No Copyright; Avail: CASI; A04, Hardcopy; A06, Microfiche

NASA's Discovery Program represents the implementation of NASA Administrator Daniel Goldin's vision of 'faster, better, cheaper' planetary missions; encompasses a series of low-cost solar system exploration missions intended to accomplish high quality, focused planetary science investigations using innovative, streamlined, and efficient approaches to assure the highest science value for the cost; and aims to enhance our understanding of the solar system by exploring the planets, their moons and other small bodies, either by traveling to them or remotely from the vicinity of Earth. The objectives of this program include the following: (1) Provide exciting and important scientific data to the global community; (2) Pursue new and innovative ways of doing business; (3) Encourage technological development by designing and testing new technologies and transferring them to the private sector; (4) Increase public awareness of, and appreciation for, solar system exploration through exciting education and public outreach activities; (5) Support national education initiatives through mission-specific programs; and (6) Ensure participation of small disadvantaged businesses, women-owned businesses, HBCUs, and other minority educational institutions in procurements.

Derived from text

Mission Planning; Space Exploration; Space Missions; Public Relations

20010082971 Tennessee State Univ., Nashville, TN USA

Multidisciplinary, Multicultural, Urban Watershed Protection and Environmental Education Project

Padgett, David, Tennessee State Univ., USA; Materials Presented at the MU-SPIN Tenth Annual Users' Conference; December 2000, pp. 429-599; In English; See also 20010082962; No Copyright; Avail: CASI; A08, Hardcopy; A06, Microfiche

This viewgraph presentation gives an overview of the multidisciplinary, multicultural, urban watershed protection and environmental education project. Details are given for watershed impact assessment and the hydrological model.

CASI

Hydrology Models; Impact; Watersheds

20010084895 NASA Goddard Space Flight Center, Greenbelt, MD USA

Materials Presented at the MU-SPIN Ninth Annual Users' Conference

Harrington, James, Jr., NASA Goddard Space Flight Center, USA; Brown, Robin L., ADNET Systems, Inc., USA; November 2000; 236p; In English; MU-SPIN Ninth Annual User's Conference, 21-25 Sep. 1999, Miami, FL, USA; See also 20010084896 through 20010084927

Report No.(s): NASA/CP-2000-209970; Rept-2001-00585-0; NAS 1.55:209970; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

MU-SPIN's Ninth Annual Users' Conference was held from September 21-25, 1999, and hosted by Florida International University, a predominantly Hispanic-serving institution located in Miami, Florida. Its theme was A New MU-SPIN for the New Millennium. The MU-SPIN conference focused on showcasing successful experiences with information technology to enhance faculty and student development in areas of scientific and technical research and education. And, it provided a forum for discussing increased participation of MU-SPIN schools in NASA Flight Missions and NASA Educational and Public Outreach activities.

Author

Education; Information Systems; Students; Conferences

20010084896 NASA Goddard Space Flight Center, Greenbelt, MD USA

Conference Summary

Harrington, James, Jr., NASA Goddard Space Flight Center, USA; Thomas, Valerie, LaVal Corp., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 1-5; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The MU-SPIN conference focused on showcasing successful experiences with information technology to enhance faculty and student development in areas of scientific and technical research and education. and it provided a forum for discussing increased participation of MU-SPIN schools in NASA Flight Missions and NASA Educational and Public Outreach activities. Opportunities for Involvement sessions focused on Space Science, Earth Science, Education, and Aeronautics. These sessions provided insight into the missions of NASA's enterprises and NASA's Education program. Presentations by NASA scientists, university Principal Investigators, and other affiliates addressed key issues for increased minority involvement.

Derived from text

Earth Sciences; Information Systems; Education; Conferences

20010084908 Tennessee State Univ., ISEM-COE, Nashville, TN USA

Tennessee State University Network Resources and Training Sites

Smith, Willard, Tennessee State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 97-98; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The Milestones and Deliverables for the Fourth Year and the previous three years of the NASA/Tennessee State University Network Resources and Training Site (NASA/TSU NRTS) have or will be accomplished by August 14, 1999 with one exception. The goal of a T3 (45 Mbps) connection for the campus was not reached. These lines were cost prohibitive. This is being replaced by Tennessee State University's participation in the development of the State of Tennessee ATM (or faster) System. This project is currently being bid. The network resources study and plans jointly developed by NASA/TSU NRTS, in collaboration with the TSU Office of Information and Communication and the Network Support Services at Goddard Space Flight Center have resulted in the implementation of an ATM Backbone for Tennessee State University. Several of the original goals for this and previous years have been exceeded.

Derived from text

Education; Support Systems; Universities; Computer Networks

20010084909 Alabama A & M Univ., Mathematics Dept., Normal, AL USA

Student Performance Assessment Research and Its Application to Curriculum Development

Temple, Enoch C., Alabama A & M Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 99-102; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

This presentation will briefly describe a current statistical study and student performance assessment methodologies that are under development at Alabama A&M University. The presentation will focus on two research objectives: (1) Develop a set of statistical models that will connect university curriculum variables to outputs such as student performance in a particular mathematics class or on post-graduate standardized examinations. (2) Use statistical models to assess the performance effectiveness of a variety of teaching and tutoring methodologies. A brief description of activities and technology infrastructure that supports objectives 1 and 2 are provided. Specific example applications of the proposed statistical model and mathematics course exit-tests will be presented. Closing comments will be related to how the above, NASA supported, research provides a statistical infrastructure which may be used to make decisions regarding curriculum adjustments.

Author

Students; Education; Mathematics; Standardization

20010084912 NASA, Washington, DC USA

Minority University Research and Education Division (MURED) Update

Malone, John, NASA, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 115-119; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Program priorities include: (1) Expand and advance NASA's scientific and technological base by building on prior year's efforts in research and academic infrastructure; (2) Increase exposure to NASA's unique mission and facilities by developing closer relationships with NASA Strategic Enterprises; (3) Increase involvement in competitive peer review and merit selection processes; (4) Contribute significantly to the Agency's strategic goals and objectives; (5) Create systemic and sustainable change through partnerships and programs that enhance research and education programs; (6) Prepare faculty and students at HBCU's for NASA-related fields and increase number of students that enter and successfully complete degrees in NASA-related fields; (7) Establish measurable program goals and objectives; and (8) Improve financial management performance.

Derived from text

Education; Research; Universities; Financial Management

20010084915 NASA Goddard Space Flight Center, Greenbelt, MD USA

Overview of Space Science and Information Research Opportunities at NASA

Green, James L., NASA Goddard Space Flight Center, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 135; In English; See also 20010084895; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

It is not possible to review all the opportunities that NASA provides to support the Space Science Enterprise, in the short amount of time allotted for this presentation. Therefore, only a few key programs will be discussed. The programs that I will discuss will concentrate on research opportunities for faculty, graduate and postdoctoral candidates in Space Science research and information technologies at NASA. One of the most important programs for research opportunities is the NASA Research Announcement or NRA. NASA Headquarters issues NRA's on a regular basis and these cover space science and computer science activities relating to NASA missions and programs. In the Space Sciences, the most important NRA is called the "Research Opportunities in Space Science or the ROSS NRA. The ROSS NRA is composed of multiple announcements in the areas of structure and evolution of the Universe, Solar System exploration, Sun-Earth connections, and applied information systems. Another important opportunity is the Graduate Student Research Program (GSRP). The GSRP is designed to cultivate research ties between a NASA Center and the academic community through the award of fellowships to promising students in science and engineering. This program is unique since it matches the student's area of research interest with existing work being carried out at NASA. This program is for U.S. citizens who are full-time graduate students. Students who are successful have made the match between their research and the NASA employee who will act as their NASA Advisor/ Mentor. In this program, the student's research is primarily accomplished under the supervision of his faculty advisor with periodic or frequent interactions with the NASA Mentor. These interactions typically involve travel to the sponsoring NASA Center on a regular basis. The one-year fellowships are renewable for up to three years and over \$20,000 per year. These and other important opportunities will be discussed.

Author

Information Systems; Space Exploration; Aerospace Engineering; Education; Cosmology; University Program; Technologies; NASA Programs; Research and Development

20010084920 Vital Strategies Group, Norfolk, VA USA

NASA Education and Public Outreach Strategies for Minority Institutions: Earth Sciences, Space Sciences, Office of Education

Baker, Robert-Allen, Vital Strategies Group, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 159-161; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Topics covered include: A. E/PO - is it Education, or Science?; B. Why is E/PO significant to minority institutions?; C. Doing your homework; D. Different levels of participation; E. Retroactive opportunity.

Derived from text

Earth Sciences; Aerospace Sciences; Aerodynamics; Aerospace Engineering; Education

20010084921 Norfolk State Univ., BEST Lab., VA USA

Awards for Research: An Opportunity for New Research Endeavors

Rodriguez, Waldo J., Norfolk State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 163-164; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The Faculty Awards for Research (FAR) program from NASA's Code EU has proven an excellent venue for young investigators at Minority Institutions (MIs) to obtain the start-up funds to establish their research program. The FAR is a single investigator award for up to \$100,000 a year for a maximum of three years. The Visualization of Atmospheric Water Vapor Data from SAGE (ViSAGE) project at Norfolk State University has been funded by a FAR award. These funds provided for the establishment of the Scientific Visualization Group at Norfolk State University and equipment for the Spartan Scientific Visualization Laboratory. Twelve students have been directly involved on atmospheric science research and scientific visualization. Seven publications with student co-authors have resulted from the research work. Although the FAR is a single investigator award, other faculty at Norfolk State University have developed an interest in Scientific Visualization and have participated in some aspects of the project. In addition, as a result of the FAR award the speaker has obtained a NASA Earth Science Enterprise grant for the Research Experience in Earth System Science programs at Norfolk State University and the prestigious NASA Administrator's Fellowship.

Derived from text

Atmospheric Moisture; Scientific Visualization; Earth Sciences; Atmospheric Chemistry

20010084924 Alabama Univ., AL USA

Creating Change in Higher Education: Constructing, Connecting and Collaborating

Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 193-218; In English; See also 20010084895; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

NASA Opportunities for Visionary Academics (NOVA) objectives are: (1) To disseminate the NOVA higher education preservice change model nationally to a diverse population of institutions, addressing critical concerns for equity and geographical distribution; (2) to sustain the change process by mentoring and partnering with workshop participants and NOVA grantees; and (3) to increase the interaction among members of the NOVA network by providing a forum for exchanging innovative ideas and leadership opportunities in higher education reform.

Derived from text

Education; NASA Programs; Leadership

20010084925 Wheeling Jesuit Univ., Wheeling, WV USA

The Earth System Science Education Alliance Program NASA Classroom of the Future

Myers, Robert J., Wheeling Jesuit Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 219-224; In English; See also 20010084895; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

There are favorable indicators concerning math and science education in our schools as reported in The Learning Curve (NSF, 1996). According to this report elementary schools in the USA are devoting more time to mathematics and science instruction. More college degrees are being awarded in the natural sciences and engineering, and many gains have been made by minorities in math and science achievement. There are still many areas needing attention, however. In 1991, American 13-year olds were outperformed on an international science assessment by students in Hungary, Korea, Taiwan, and Switzerland (National Education Goals Panel, 1995). Teacher preparation still remains weak, with close to one-third of elementary teachers never having taken a three-credit hour course in biological, physical, or the earth systems sciences. In fact, less than 30 percent of elementary school teachers say they feel well qualified to teach life science (NSF, 1996). Research also suggests that students in science classes engage in tasks with low cognitive demand-emphasizing the memorization of facts and algorithms without understanding why the algorithms work. The role of the teacher is changing dramatically as we move toward the twenty-first century. A consensus

of educators view teachers as key components in the development and implementation of any curricular reform. Teachers must be well-prepared for the critical role they will play, particularly if schools are to continuously improve and adopt strategies associated with inquiry and information-centered technology. The tradition of "teaching the way I was taught in graduate school" may be a notion of the past as educators poise for the continuous renewal and invigoration of their classroom methodologies in light of new, upcoming technologies.

Derived from text

Education; Earth Sciences; Life Sciences; Learning Curves; Algorithms

20010087660 NASA Goddard Space Flight Center, Greenbelt, MD USA

Strategies for Engaging NASA Earth Scientists in K-12 Education and Public Outreach

Meeson, Blanche W., NASA Goddard Space Flight Center, USA; Gabrys, Robert E., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; AGU Spring Meeting, 29 May - 2 Jun. 2001, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Engagement of the Earth Science research community in formal education at the kindergarten through high school level and in various aspects of informal education and in professional development of practitioners in related fields has been and continues to be a challenge. A range of approaches is being used and new ones are constantly being tried. Fundamental to our strategies is an understanding of the priorities, skills, academic experiences, motivation, rewards and work experiences of most scientists. It is within this context that efforts to engage a scientist in education efforts are attempted. A key strategy is to limit our requests to activities where the scientist's contribution of time and expertise can have the most impact. Don't waste the scientist's time! Time is one of their most prized resources, it is extremely valuable to you, and to them, we treat their time like a treasured resource. The clearer a scientist's role, their unique contribution and the finite nature of their effort, the more likely they are to participate. It is critical that commitments made to scientists are kept. If they want and can do more, great! Don't expect or assume more will be forthcoming. Another approach that we use is to create periodic venues that, among other things, serve to identify individuals who have an interest or inclination to contribute to education efforts. Once identified we strive to determine their interests so that we can make the best match between their interests and the needs of the education program or efforts. In this way, we try to make the best use of their time while engaging them in efforts which will be personally rewarding, and will further the overall education objectives. In addition, we try to make it easier for scientists to participate by providing focused training, such as development of their interviewing skills, and exposure to key concepts, knowledge and skills which are well known among educators but are not common knowledge among scientists. Another strategy with which we are still struggling is how to create and provide career meaningful rewards for individuals who demonstrate excellence in education equivalent to excellence in science. We do not yet have a yardstick to measure excellence in education nor is there a consensus among scientific peers that these two can be equivalent. None-the-less, methods to identify excellence in education, such as the peer review process, are being tried with some success. Use of solicitation and selection of educational efforts via a peer review process that is the same as for scientific research to identify unique, interesting and creative ideas has been somewhat effective. Furthermore, the application of the same peer review process to the output of an educational effort is used to validate and ensure the quality of this output. An example will be used to illustrate the application of some of these strategies to the development of a high school Earth and Space System Science curriculum created in partnership with a local county school system (Anne Arundel County, MD).

Author

Earth Sciences; Education; Schools; Exposure

81

ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20010083751 Helsinki Univ. of Technology, Dept. of Industrial Engineering and Management, Espoo, Finland

Abstracts of the Conference on Academia, Industry Interface: Learning from Each Other

Maeki, E.; Wallenius, H.; Oct. 12, 2000; ISSN 1239-484X; 46p; In English; 2nd; Doctoral Colloquium in Industrial Engineering and Management, 12 Oct. 2000, Espoo, Finland

Report No.(s): PB2001-107323; TKK-WP-24; ISBN 951-22-5189-2; Copyright; Avail: Issuing Activity; Abstracts Only

Academia-Industry Interface: Learning from Each other is the theme of the second doctoral colloquium organized by the Department of Industrial Engineering and Management. by this choice the authors want to emphasize the importance of the co-operation between universities and industry. For people in academia the industry provides meaningful and real-world problems and an outlet to test their theories. For those working in industry the academia can provide systematic ways to look at complex

problems. Through collaboration people can jointly find solutions to these problems, implement and advance the theory. The papers presented were organized in six sessions according to the following topics: Organizational Learning, Change Management, Systems and Operations Improvement, Demand-Supply Chain, New Business Paradigms, and Strategic Change. The large variety of topics well describes the interdisciplinary nature of the authors' IEM Department. These proceedings only include the abstracts of the presented papers.

NTIS

Industrial Management; Management Systems; Conferences

20010083767 National Science Foundation, Arlington, VA USA

National Science Foundation Guide to Programs: FY2001 NSF Funding Opportunities

2001; 172p; In English

Report No.(s): PB2001-107510; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75). NSF funds research and education in most fields of science and engineering. It does this through grants to and cooperative agreements with more than 2,000 colleges, universities, K12 school systems, businesses, NSF receives approximately 30,000 proposals each year for research, education, and training projects, of which approximately 10,000 are funded. The Guide to Programs is a compilation of funding opportunities offered by the National Science Foundation for research and education in science, mathematics, engineering, and technology. The Guide includes broad, general descriptions of programs and activities for each NSF Directorate, as well as sources for more information.

NTIS

Research and Development; Education; Research Management; Grants; Project Management

20010084178 NASA Ames Research Center, Moffett Field, CA USA

Challenges of Information Technology Security in the NASA Environment

Santiago, S. S., NASA Ames Research Center, USA; [2000]; 1p; In English; ICM Conference, 17-19 May 2000, Sydney, Australia; No Copyright; Avail: Issuing Activity; Abstract Only

A brief description of the NASA organization and how the CIO responsibilities are integrated into that organization followed by an introduction of the NASA ITS Program goals and objectives. An overview of the four major enterprises' cultures and how those cultures tie back to the Enterprises' missions. A description of the ITS challenges that exist stemming from the competing NASA Enterprises' requirements and how they have formed the basis of the NASA ITS Program. A talk will focus on policies and procedures and the technology being incorporated into the NASA infrastructure and how that technology ties back to the policies and procedures.

Derived from text

Information Systems; NASA Programs; Organizations

20010085801 NASA Kennedy Space Center, Cocoa Beach, FL USA

Principal Center Updates

Barry, William, NASA Kennedy Space Center, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 11-16; In English; See also 20010085800; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

NASA's Occupational Health Program Manager briefed attendees on current Agency initiatives and projects affecting Center Occupational Health personnel. Plans, insight, and expectations for the coming year will be discussed.

Author

Health; Personnel

20010085804 Ballas (Linda) and Associates, USA

Occupational Safety and Health Administration (OSHA) Recordability

Ballas, Linda, Ballas (Linda) and Associates, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 31-34; In English; See also 20010085800; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

This presentation is intended to provide attendees with an overview of Occupational Safety and Health Administration (OSHA) record keeping guidelines with regard to occupational injuries and illnesses. Both recordable and non-recordable cases will be discussed, various types of medical treatment guidelines, definition of work-relationship and modified duty issues.

Author

Health; Safety; Records Management

20010085805 USA Attorney's Office, Lafayette, LA USA

Workers Compensation

Regan, Larry J., USA Attorney's Office, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 35-36; In English; See also 20010085800; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Overview of the Federal Employees Compensation Act (FECA): (1) Rationale for the program; (2) FECA is not a retirement program. The impacts of fraud on the FECA Program and NASA Budgets include: (1) First year FECA Program in effect - \$35,000 expended; (2) At end of this century, total program costs will be approximately 1.9 to 2 billion dollars; (3) In beginning funds came out of US Department of Labor's (DOL) budget, but within last 20 years, FECA costs for each federal agency/department are charged back to that agency/department at end of DOL'S fiscal year; (4) FECA Program funds are administered through regional DOL offices by the Office of Workers Compensation Programs; and (5) NASA as Department of Defense has set budget figure to cover its FECA program costs. If budget amount exceeded in any given year comes out of NASA's hide in other ways. Additional information is contained in the original extended abstract.

Author

Costs; Financial Management

20010085809 NASA Kennedy Space Center, Cocoa Beach, FL USA

Contracting Officer Technical Representative Briefing

Gettleman, Alan, NASA Kennedy Space Center, USA; Proceedings from the 2001 NASA Occupational Health Conference: Risk Assessment and Management in 2001; May 31, 2001, pp. 53-56; In English; See also 20010085800; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

This viewgraph presentation gives an overview of the Agency Occupational Health Program, including details on organizational and personnel changes, medical program standardization, programmatic status, policies, standards, and guides and resources, industrial hygiene and radiological health, assessment schedule and methodology, upcoming events, and the future of the program.

CASI

Health; Policies; Standardization

82

DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

20010083350 Helsinki Univ. of Technology, Neural Networks Research Centre, Espoo, Finland

Text Retrieval Using Self-Organized Document Maps: Publications in Computer and Information Science

Lagus, K.; 2000; 14p; In English

Report No.(s): PB2001-106866; Copyright; Avail: National Technical Information Service (NTIS)

A map of text documents arranged using the Self-Organizing Map (SOM) algorithms (1) is organized in a meaningful manner so that items with similar content appear at nearby locations of the 2-dimensional map display, and (2) clusters the data, resulting in an approximate model of the data distribution in the high-dimensional document space. This report describes how a document map that is automatically organized for browsing and visualization can be successfully utilized also in speeding up document retrieval. Furthermore, experiments on the well-known CISI collection indicate improved performance compared to Salton's vector space model and to Latent Semantic Indexing, measured by average precision when retrieving a small, fixed number of best documents.

NTIS

Information Retrieval; Algorithms; Self Organizing Systems; Data Retrieval; Texts

20010083362 NASA Ames Research Center, Moffett Field, CA USA

ScienceDesk Project Overview

Keller, Richard M., NASA Ames Research Center, USA; [2000]; 36p; In English; Sponsored in part by CETDP, NAI, and IS.; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA's ScienceDesk Project at the Ames Research Center is responsible for scientific knowledge management which includes ensuring the capture, preservation, and traceability of scientific knowledge. Other responsibilities include: 1) Maintaining uniform information access which is achieved through intelligent indexing and visualization, 2) Collaborating both asynchronous and synchronous science teamwork, 3) Monitoring and controlling semi-autonomous remote experimentation.

Author (revised)

Information Management; Information Transfer; Information Dissemination

20010083465 Computer Sciences Corp., Moffett Field, CA USA

An Advanced User Interface Approach for Complex Parameter Study Process Specification in the Information Power Grid

Yarrow, Maurice, Computer Sciences Corp., USA; McCann, Karen M., Computer Sciences Corp., USA; Biswas, Rupak, Computer Sciences Corp., USA; VanderWijngaart, Rob, Computer Sciences Corp., USA; [2000]; 10p; In English

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The creation of parameter study suites has recently become a more challenging problem as the parameter studies have now become multi-tiered and the computational environment has become a supercomputer grid. The parameter spaces are vast, the individual problem sizes are getting larger, and researchers are now seeking to combine several successive stages of parameterization and computation. Simultaneously, grid-based computing offers great resource opportunity but at the expense of great difficulty of use. We present an approach to this problem which stresses intuitive visual design tools for parameter study creation and complex process specification, and also offers programming-free access to grid-based supercomputer resources and process automation.

Author

Interfaces; Parameterization; Computation; Supercomputers; Specifications; Computational Grids

20010083752 National Telecommunications and Information Administration, Washington, DC USA

On-line Development of an Interactive Web Glossary

Ingram, W. J.; Gray, E. M.; Apr. 2001; 120p; In English

Report No.(s): PB2001-106920; NTIS-01-385; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report describes the electronic, computer-based processes of creating an on-line, Web-based glossary of telecommunication terms-American National Standard, T1.523-2001, Telecom Glossary 2000. These e-mail processes or Web-based processes constituted electronic meetings or 'virtual meetings' to solicit public review comments for updating the glossary. The programming design, structure, and some of the code used to gather e-mail comments and to build the glossary Web pages are discussed in the report. With the exception of the kickoff meeting and the resolution meeting, all interim meetings of the glossary-development Ad Hoc Group consisted of e-mail exchanges or Web-page modifications. This electronic meeting forum allowed a broader participation in the revisions, wider distribution of comments, speedier development of the glossary, and economy of resources. The completed product is scheduled to be available free of charge to the public on the ATIS (Alliance for Telecommunications Industry Solutions)/T1 Web site.

NTIS

Computer Techniques; On-Line Systems; Websites; Dictionaries; Electronic Mail

20010083954 National Highway Traffic Safety Administration, Washington, DC USA

Problems, Solutions and Recommendations for Implementing CODES (Crash Outcome Data Evaluation System)

Feb. 2001; 72p; In English

Report No.(s): PB2001-107577; DOT HS 809 200; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Problems, solutions and recommendations for implementation have been contributed by 16 of the 27 CODES states and organized as appropriate under the administrative, linkage and application requirements for a Crash Outcome Data Evaluation System (CODES). The purpose of this report is to provide feedback to states interested in implementing CODES. A background section describes the funding of the CODES states and the CODES Model. Administrative problems focus on maintaining communication, supporting a collaborative source of authority, developing policies for confidentiality and release of CODES linked data, managing CODES and Institutionalization. Linkage problems focus on data access, data quality/preparation, linkage,

and validation. Application problems focus on statistical issues, personnel issues, confidentiality issues, limitations for case selection, production issues, decision making and Web site development. Recommendations for successful implementation also are organized under the administrative, linkage and application categories.

NTIS

Crashes; Data Systems; Feedback; Accidents; Recommendations

20010084634 Dartmouth Coll., Hanover, NH USA

Mobile Information Agents Final Report, Jan. 1998 - Jan. 2001

Rus, Daniela; Apr. 2001; 141p; In English

Contract(s)/Grant(s): F30602-98-C-0006; AF Proj. 2532

Report No.(s): AD-A390712; AFRL-IF-RS-TR-2001-44; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

The main goals for this project were to develop automated information organization algorithms, and to integrate the information organization algorithms in a mobile agent platform. The main objective was to investigate and demonstrate the value of a paradigm of computation in heterogeneous distributed systems with non-permanent network connections, in which mobile agents bring the computation to the data. As a result, a system called D'Agents that supports mobile agents has been developed. D'Agents is especially suited to distributed information access experiments in a network of mobile computers, such as laptops, palmtops, and other wireless devices. In addition, this effort has developed, implemented, and evaluated an information organization algorithm called the star algorithm. The star algorithm gives an organization of collection into clusters. Results for this effort include: 1. Information overload is a serious problem and efficient automatic information organization algorithms are useful in addressing this problem. 2. The Star Clustering algorithms: a. is the best performing algorithm for large-scale information organization, b. can be used in an on-line or off-line fashion and has several scalable extensions, c. has been analyzed and this effort's large-scale experiments math the theory, d. can be used for filtering applications and for persistent queries. 3. by combining the Star clustering algorithm with the power of mobile agent system, we increase system performance dramatically.

DTIC

Computer Networks; Algorithms; Software Engineering; Distributed Processing

20010084900 City Univ. of New York, Dept. of Computer Science, Brooklyn, NY USA

Network Configuration of Oracle and Database Programming Using SQL

Davis, Melton, City Univ. of New York, USA; Abdurrashid, Jibril, Bernard Baruch Coll., USA; Diaz, Philip, City Univ. of New York, USA; Harris, W. C., City Univ. of New York, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 49-51; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

A database can be defined as a collection of information organized in such a way that it can be retrieved and used. A database management system (DBMS) can further be defined as the tool that enables us to manage and interact with the database. The Oracle 8 Server is a state-of-the-art information management environment. It is a repository for very large amounts of data, and gives users rapid access to that data. The Oracle 8 Server allows for sharing of data between applications; the information is stored in one place and used by many systems. My research will focus primarily on SQL (Structured Query Language) programming. SQL is the way you define and manipulate data in Oracle's relational database. SQL is the industry standard adopted by all database vendors. When programming with SQL, you work on sets of data (i.e., information is not processed one record at a time).

Author

Structured Programming; Query Languages; Data Base Management Systems; Language Programming; Information Management

20010084901 City Univ. of New York, Dept. of Physical, Environment and Computer Sciences, Brooklyn, NY USA

The Network Configuration of an Object Relational Database Management System

Diaz, Philip, City Univ. of New York, USA; Harris, W. C., City Univ. of New York, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 53-56; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The networking and implementation of the Oracle Database Management System (ODBMS) requires developers to have knowledge of the UNIX operating system as well as all the features of the Oracle Server. The server is an object relational database management system (DBMS). by using distributed processing, processes are split up between the database server and client application programs. The DBMS handles all the responsibilities of the server. The workstations running the database application concentrate on the interpretation and display of data.

Author

Data Base Management Systems; Distributed Processing; UNIX (Operating System); Data Bases

20010085383 Technical Univ. of Wroclaw, Wroclaw, Poland

International Conference on SOL-GEL Materials Research, Technology, Applications

Jun. 16, 2001; 58p; In English, 13-16 Jun. 2001, Wroclaw, Poland; Sponsored by ABB Corporate Research, Poland

Contract(s)/Grant(s): N68171-01-M-5778

Report No.(s): AD-A392744; R/D-9176-MS-02; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy; Abstracts Only; Abstracts Only

Partial Contents; Synthesis-Materials-Applications, Rare Earth Systems, Nanomaterials/Doped Matrices, and Electrochemical properties.

DTIC

Technology Utilization; Sol-Gel Processes; Doped Crystals; Rare Earth Elements

20010085385 George Washington Univ., Computer Science Dept., Washington, DC USA

Remote Evaluation of the Coherence of Indirect Manipulation Interface Systems For Agent-Mediated Legacy Data

Schafer, Joseph H.; May 21, 2000; 295p; In English; Original contains color plates

Report No.(s): AD-A392751; Copyright; Avail: Issuing Activity

Many information systems depend heavily on distributed legacy data sources. These data sources introduce a number of significant problems, especially when the sources must be combined and displayed to remote users. Many researchers have investigated various interface systems, however empirical studies have not been published that examine remote interfaces to distributed heterogeneous data. The purpose of this research is to determine the efficacy of a system that provides a more coherent representation of this distributed data in comparison to a more traditional system for users performing representative tasks. This dissertation presents the results of remote usability experiments in a specific, well-defined context. These web-based experiments empirically determine whether coherence is enhanced through application of the proposed methodology by presenting each interface system and a sequence of representative tasks. The remote evaluation system measures coherence based upon the subject's time to complete each task, the correctness of their answer, and their subjective confidence in that answer. When all tasks have been completed, the respondents complete a usability survey to express their satisfaction with the interface system. The specific research undertaking is to determine whether a system based upon this proposed methodology, the Visual Interface to Agent Mediated Information Networks (VITAMIN) system, is superior to a system based upon a traditional approach, the Java Indirect Manipulation Interface (JIMI) system. VITAMIN was developed to add coherence to the legacy data and JIMI was developed as a control treatment to represent a traditional legacy approach. Both VITAMIN and JIMI were implemented as indirect manipulation interface systems, or non-anthropomorphic interface agents.

DTIC

Information Systems; Remote Control; Computer Networks; Software Development Tools; Distributed Processing

20010085386 Padua Univ., Italy

WOCSDice 2001: 25 Workshop On Compound Semiconductor Devices and Integrated Circuits Held in Europe

Vanzl, Massimo; Meneghesso, Gaudenzio; May 30, 2001; 182p; In English, 27-30 May 2001, Sardinia, Italy

Contract(s)/Grant(s): N68171-01-M-5758

Report No.(s): AD-A392754; R/D-9177-EE-03; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

Partial Contents: MMIC and Advanced Circuits, Heterojunction Bipolar Transistors, GaN: material growth and device processing, Characterization of GaAs and InP-based devices, Poster Session, Optoelectronics, Device and Material Characterization, Advanced Devices and Materials, GaN-based Device, SIC- and GaN- based devices.

DTIC

Integrated Circuits; Microwave Circuits; Bipolar Transistors

20010087029 NASA Ames Research Center, Moffett Field, CA USA

Discovering Communicable Scientific Knowledge from Spatio-Temporal Data

Schwabacher, Mark, NASA Ames Research Center, USA; Langley, Pat, Institute for the Study of Learning and Expertise, USA; Jan. 29, 2001; 8p; In English; International Conference on Machine Learning, 28 Jun. - 1 Jul. 2001, Williamstown, MA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes how we used regression rules to improve upon a result previously published in the Earth science literature. In such a scientific application of machine learning, it is crucially important for the learned models to be understandable and communicable. We recount how we selected a learning algorithm to maximize communicability, and then describe two

visualization techniques that we developed to aid in understanding the model by exploiting the spatial nature of the data. We also report how evaluating the learned models across time let us discover an error in the data.

Author

Machine Learning; Scientific Visualization; Regression Analysis; Algorithms

20010087784 NASA Goddard Space Flight Center, Greenbelt, MD USA

Syntactic and Semantic Validation without a Metadata Management System

Pollack, Janine, NASA Goddard Space Flight Center, USA; Gokey, Christopher D., Science Systems and Applications, Inc., USA; Kendig, David, Science Systems and Applications, Inc., USA; Olsen, Lola, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; Digital Earth/EOGEO Conference, Fredericton, New Brunswick, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

The ability to maintain quality information is essential to securing the confidence in any system for which the information serves as a data source. NASA's Global Change Master Directory (GCMD), an online Earth science data locator, holds over 9000 data set descriptions and is in a constant state of flux as metadata are created and updated on a daily basis. In such a system, the importance of maintaining the consistency and integrity of these-metadata is crucial. The GCMD has developed a metadata management system utilizing XML, controlled vocabulary, and Java technologies to ensure the metadata not only adhere to valid syntax, but also exhibit proper semantics.

Author

Data Management; Semantics; Syntax; Java (Programming Language); Directories

20010087788 Institut Rudjer Boskovic, Zagreb Yugoslavia

Brijuni Conference 7: Important Problems for the 21st Century

Bosanac, S. D.; Doslic, N.; Sep. 01, 2000; 61p; In English, 28 Aug. - 1 Sep. 2000, Brijuni, Croatia

Contract(s)/Grant(s): F61775-00-WF001

Report No.(s): AD-A392800; EOARD-CSP-00-5001; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy; Abstracts Only; Abstracts Only

The Final Proceedings for Brijuni conference - Important problems for the XXI century, 28 August 2000 - 1 September 2000. This is a multi-disciplinary conference covering basic research topics in chemistry, physics and biology.

DTIC

Conferences; Multidisciplinary Research

20010089150 NASA Langley Research Center, Hampton, VA USA

Buckets: Smart Objects for Digital Libraries

Nelson, Michael L., NASA Langley Research Center, USA; August 2001; 177p; In English

Contract(s)/Grant(s): RTOP 992-16-05

Report No.(s): NASA/TM-2001-211049; NAS 1.15:211049; L-18106; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Current discussion of digital libraries (DLs) is often dominated by the merits of the respective storage, search and retrieval functionality of archives, repositories, search engines, search interfaces and database systems. While these technologies are necessary for information management, the information content is more important than the systems used for its storage and retrieval. Digital information should have the same long-term survivability prospects as traditional hardcopy information and should be protected to the extent possible from evolving search engine technologies and vendor vagaries in database management systems. Information content and information retrieval systems should progress on independent paths and make limited assumptions about the status or capabilities of the other. Digital information can achieve independence from archives and DL systems through the use of buckets. Buckets are an aggregative, intelligent construct for publishing in DLs. Buckets allow the decoupling of information content from information storage and retrieval. Buckets exist within the Smart Objects and Dumb Archives model for DLs in that many of the functionalities and responsibilities traditionally associated with archives are pushed down (making the archives dumber) into the buckets (making them smarter). Some of the responsibilities imbued to buckets are the enforcement of their terms and conditions, and maintenance and display of their contents.

Author

Information Retrieval; Data Base Management Systems; Integrated Library Systems; Computer Programs

ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20010084266 Mount Auburn Associates, Inc., Somerville, MA USA

Thrid-Tier Cities: Adjusting to the New Economy

Siegel, B.; Waxman, A.; Jun. 2001; 52p; In English

Contract(s)/Grant(s): EDA-99-07-13800

Report No.(s): PB2001-107283; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This paper develops a new categorization of America's smaller cities and focuses attention on older industrial small cities that face significant challenges in their efforts to prosper in the new economic environment. First, the paper defines 'third tier' cities as those between 15,000 and 110,000 in population; with a primary role in the surrounding economic region; and having experienced a substantial population decline, or modest growth, since 1950. Second, the paper focuses on the major barriers to economic adjustment faced by these third-tier cities, such as outmoded infrastructure, dependency on traditional industry, declining competitiveness in their region, weakened civic capacity, and limited access to financial resources. These major trends and economic conditions pose serious threats and the success of these cities in the New Economy. The premise of this paper is not that these problems are necessarily worse in smaller cities, but rather that many of the problems identified with the nation's largest cities are also found in smaller cities. Moreover, the smaller scale of these cities provides an added burden.

NTIS

Economic Development; Cities; Urban Development; Economic Factors

LAW, POLITICAL SCIENCE AND SPACE .POLICY

Includes: aviation law; space law and policy; international law; international cooperation; and patent policy

20010084783 National Defence Research Establishment, Div. of Defence Analysis, Stockholm, Sweden

Prospects for Success in International Interventions. The Examples of Economic Sanctions and Peace Enforcement: LOPETAN VII Mojiligheter Till Lyckade Internationella Insatser. Exemplen Ekonomiska Sanktioner Och Fiedsframtingano Operationer

Stoeberg, K.; Dec. 2000; ISSN R-00-01755-170-SE; 88p; In English

Report No.(s): PB2001-107296; FOA-R-00-01755-170-SE; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this report is to explore under what conditions successful multilateral interventions into violent intrastate conflicts are likely to be successful. Moreover, the possibilities of creating a model for these conditions in order to enhance the understanding and the prospects for future research are investigated. The report is limited to include economic sanctions and actions of peace enforcement and is carried out by turning to scholarly research and debate already undertaken in the area, from which a critical discussion is conducted. In the last two chapters the most important results from the report is concluded, and an 'index' of more or less successful conditions is created. Furthermore, there is a discussion on a possible model for the conditions found and some suggestions for further research. The study should be seen as a 'pilot study,' meaning to contribute with some valuable indications for further and more comprehensive research.

NTIS

International Relations; Economic Impact

TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see 03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion. For specific technology transfer applications see also the category where the subject is treated.

20010088172 NASA Ames Research Center, Moffett Field, CA USA

Accelerating Innovation: Turning Goals into Reality

VanDalsem, William R., NASA Ames Research Center, USA; [2000]; 13p; In English; TIGRE Conference, 18-19 May 2000,

Huntsville, AL, USA; Sponsored by NASA, USA

Contract(s)/Grant(s): RTOP 509-10-00; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The success of NASA's programs depends upon innovation, which is recognized by several characteristics. All aspects of a program including tools, processes, materials, subsystems, vehicles, and operations should be evaluated to determine possible innovations which might be implemented. Several examples are presented of ways in which innovation has substantially furthered the goals of NASA. The specific fields mentioned include high performance computing, advanced technologies for aerospace system design, advanced materials and manufacturing processes, neural based flight control, linear aerospike engines, advanced space propulsion systems, high altitude and long duration autonomous flights, advanced vehicle concepts, advanced space propulsion systems, as well as advanced weather information. A final list details the perceived ways in which NASA can benefit from continued innovation in such ways as partnering with the private sector.

CASI

NASA Programs; Technology Assessment; Technology Utilization; Research and Development

88

SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in Space Sciences see categories 89 through 93.

20010084917 Smithsonian Astrophysical Observatory, Solar and Stellar Div., Cambridge, MA USA

EPO Opportunities Associated with Space Science Research Grants

Strachan, Leonard, Smithsonian Astrophysical Observatory, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 147-150; In English; See also 20010084895; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Topics covered include: (1) Organization: Who we are; (2) Space Science Projects (at SAO and GSFC); (3) Current EPO Activities; (4) Proposed Activities; (5) Useful Project Web Sites; and (6) How to get involved.

Derived from text

Education; Websites; Grants; Research Projects; Aerospace Sciences

20010086418 Courter Products, Boyne City, MI USA

US/European Celestial Mechanics Workshop

Jul. 07, 2000; 94p; In English, 3-7 Jul. 2000, Poznan, Poland

Contract(s)/Grant(s): F61775-00-WF003

Report No.(s): AD-A392921; EOARD-CSP-00-5003; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

The Final Proceedings for US/European Celestial Mechanics Workshop, 3 September 2000 - 4 September 2000 1. Chaos, Resonances & Stability 2. Kuiper Belt Objects 3. Satellites, Minor Planets, Comets, and Meteors 4. Orbit Uncertainty and Error Analysis for NEO and Artificial Satellites 5. Stellar and Galactic Dynamics * 6. Drag and Atmospheric Modeling & Theory (Non-gravitational Force Modeling) 7. Numerical Methods, Parallel Processing, Ephemeris Generation 8. Satellite Constellation Dynamics and Control 9. Orbit and Attitude Dynamics 10. NEO and Debris Observations and Motions 11. Reference Systems for Astronomy and Astrodynamics 12. Exo-planetary systems 13. General perturbations methods

DTIC

Conferences; Celestial Mechanics; Planetary Systems

20010089132 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Living With a Star Space Environment Testbed Program

Barth, Janet, NASA Goddard Space Flight Center, USA; LaBel, Kenneth, NASA Goddard Space Flight Center, USA; [2001]; 17p; In English; Small Payload Rideshare Conference, 30-31 May 2001, Monterey, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA has initiated the Living with a Star (LWS) Program to develop the scientific understanding to address the aspects of the Connected Sun-Earth system that affects life and society. The Program Architecture includes science missions, theory and modeling and Space Environment Testbeds (SET). This current paper discusses the Space Environment Testbeds. The goal of the SET program is to improve the engineering approach to accommodate and/or mitigate the effects of solar variability on spacecraft

design and operations. The SET Program will infuse new technologies into the space programs through collection of data in space and subsequent design and validation of technologies. Examples of these technologies are cited and discussed.

CASI

Solar Activity Effects; NASA Space Programs; Solar Terrestrial Interactions; Space Weather; Sun; Aerospace Environments; Spacecraft Design; Design Analysis

89 ASTRONOMY

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20010083760 Space Telescope Science Inst., Baltimore, MD USA

X-Ray Oscillations in AM Herculis Binaries *Final Report, 1 Feb. 1998 - 31 Jan. 2001*

Barrett, Paul, Space Telescope Science Inst., USA; Jul. 16, 2001; 7p; In English

Contract(s)/Grant(s): NAG5-8402; STScI Proj. J0178; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Presents a final analysis of a research project at the Space Telescope Science Institute with funding from NASA. The project used the Rossi X-Ray Timing Explorer (RXTE) to detect both high (1-3 s) and low (approx. 600 s) frequency quasi-periodic oscillations (QPOs) from 6 AM Herculis binaries. Simultaneous optical observations of QPOs were used in making sensitive analyses of these QPOs. Observations of 6 binaries enabled a test of the relationship of frequency and magnetic field strength for the high frequency QPOs and observations of binaries of different orbital periods enabled the distinction between the two competing models of low frequency oscillations.

Derived from text

Binary Stars; X Ray Timing Explorer; Stellar Oscillations

20010084309 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Discovery of a Second Luminous Low Mass X-Ray Binary System in the Globular Cluster M15

White, Nicholas E., NASA Goddard Space Flight Center, USA; Angelini, Lorella, NASA Goddard Space Flight Center, USA; [2001]; 15p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Using the Chandra X-ray Observatory we have discovered a second bright X-ray source in the globular cluster M15 that is 2.7" to the west of AC211, the previously known low mass X-ray binary (LMXB) in this system. Prior to the 0.5" imaging capability of Chandra this second source could not have been resolved from AC211. The luminosity and spectrum of this new source, which we call M15-X2, are consistent with it also being a LMXB system. This is the first time that two LMXBs have been seen to be simultaneously active in a globular cluster. The new source, M15-X2, is coincident with a 18th U magnitude very blue star. The discovery of a second LMXB in M15 clears up a long standing puzzle where the X-ray and optical properties of AC211 appear consistent with the central source being hidden behind an accretion disk corona, and yet also showed a luminous X-ray burst suggesting the neutron star is directly visible. This discovery suggests instead that the X-ray burst did not come from AC211, but rather from the newly discovered X-ray source. We discuss the implications of this discovery for X-ray observations of globular clusters in nearby galaxies.

Author

Globular Clusters; X Ray Binaries; Image Resolution; X Ray Sources; Luminosity; Mass; Optical Properties; X Ray Astrophysics Facility

20010084320 Naval Academy, Annapolis, MD USA

Celestial Navigation on the Surface of Mars

Malay, Benjamin P.; May 07, 2001; 34p; In English

Report No.(s): AD-A392455; USNA-1531-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A simple, accurate, and autonomous method of finding position on the surface of Mars currently does not exist. The goal of this project is to develop a celestial navigation process that will fix a position on Mars with 100-meter accuracy. This method requires knowing the position of the stars and planets referenced to the Martian surface with one arcsecond accuracy. This information is contained in an ephemeris known as the Aeronautical Almanac (from Ares, the god of war). Naval Observatory Vector Astrometry Subroutines (NOVAS) form the basis of the code used to generate the almanac. Planetary position data come from the JPL DE405 Planetary Ephemeris. The theoretical accuracy of the almanac is determined mathematically and compared with the Ephemeris for Physical Observations of Mars contained in the Astronautical Almanac. A preliminary design of an autonomous

celestial navigation system is presented. Recommendations of how to integrate celestial navigation into NASA's current Mars exploration program are also discussed. This project is a useful and much-needed first step towards establishing celestial navigation as a practical way to find position on the surface of Mars.

DTIC

Celestial Navigation; Position (Location); Autonomous Navigation; Mars Surface

20010084624 NASA Ames Research Center, Moffett Field, CA USA

Molecular Spectroscopy in Astrophysics: Interstellar PAHs

Salama, Farid, NASA Ames Research Center, USA; [2000]; 1p; In English; XXV European Congress on Molecular Spectroscopy (EUCMOS), 27 Aug. 1 Sep. 2000, Coimbra, Portugal

Contract(s)/Grant(s): RTOP 344-01-57-41; No Copyright; Avail: Issuing Activity; Abstract Only

Polycyclic aromatic hydrocarbons (PAHs) are now considered to be an important and ubiquitous component of the organic material in space. PAHs are found in a large variety of extraterrestrial materials such as interplanetary dust particles (IDPs) and meteoritic materials. PAHs are also good candidates to account for the infrared emission bands (UIRs) and the diffuse interstellar optical absorption bands (DIBs) detected in various regions of the interstellar medium. The recent observations made with the Infrared Space Observatory (ISO) have confirmed the ubiquitous nature of the UIR bands and their carriers. PAHs are thought to form through chemical reactions in the outflow from carbon-rich stars in a process similar to soot formation. Once injected in the interstellar medium, PAHs are further processed by the interstellar radiation field, interstellar shocks and energetic particles. A long-term laboratory effort has been undertaken to measure the physical and chemical characteristics of these carbon molecules and their ions under experimental conditions that mimic the interstellar conditions. These measurements require collision-free conditions where the molecules and ions are cold and chemically isolated. The spectroscopy of PAHs under controlled conditions represents an essential diagnostic tool to study the evolution of extraterrestrial PAHs. The laboratory results will be discussed as well as the implications for astronomy and for molecular spectroscopy. A review of the data generated through laboratory simulations of space environments and the role these data have played in our current understanding of the properties of interstellar PAHs will be presented. We will also present the new generation of laboratory experiments that are currently being developed in order to provide a closer simulation of space environments and a better support to space missions.

Author

Absorption Spectra; Diffuse Interstellar Bands; Energetic Particles; Environment Simulation; Interplanetary Dust; Interstellar Gas; Interstellar Matter; Organic Materials

20010084720 NASA Ames Research Center, Moffett Field, CA USA

Infrared Spectroscopy of Black Hole Candidates

Colgan, Sean W., NASA Ames Research Center, USA; Cotera, A. S., Arizona Univ., USA; Maloney, P. R., Colorado Univ., USA; Hollenbach, D. J., NASA Ames Research Center, USA; [2000]; 1p; In English; American Astronomical Society, 4-8 Jun. 2000, Rochester, NY, USA

Contract(s)/Grant(s): RTOP 263-10-30; No Copyright; Avail: Issuing Activity; Abstract Only

ISO LWS and SWS observations of the approx. solar mass black hole candidates 1E1740.7-2942 and GRS1758-258 are presented. For 1E1740.7-2942, it has been suggested that the luminosity is provided in whole or part by Bondi-Hoyle accretion from a surrounding black hole (Bally & Leventhal 1991, Nat, 353,234). Maloney et al. (1997, ApJ482, L41) have predicted that detectable far-infrared line emission from [OI] (63 microns), [CII] (158 microns), [SiII] (35 microns) and other lines will arise from black holes which are embedded in molecular clouds. No strong line emission associated with either 1E1740.7-2942 or GRS1758-258 was detected, implying either that 1) these sources are not embedded in dense molecular clouds, or 2) that their average X-ray luminosity over the past 100 years is significantly lower than its current value. The measured upper limits to the line fluxes are compared with the models of Maloney et al. to constrain the properties of the ISM in the vicinity of these X-ray sources.

Author

Black Holes (Astronomy); Infrared Spectroscopy; X Ray Sources; Stellar Mass

20010084729 NASA Ames Research Center, Moffett Field, CA USA

Detection of Extrasolar Planets by Transit Photometry

Borucki, William, NASA Ames Research Center, USA; Koch, David, NASA Ames Research Center, USA; Webster, Larry, NASA Ames Research Center, USA; Dunham, Edward, Lowell Observatory, USA; Witteborn, Fred, Orbital Sciences Corp., USA; Jenkins, Jon, Search for Extraterrestrial Intelligence Inst., USA; Caldwell, Douglas, National Academy of Sciences - National Research Council, USA; Showen, Robert, Raytheon Co., USA; [2000]; 1p; In English; Astrobiology Science

Conference, 3-5 Apr. 2000, Moffett Field, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A knowledge of other planetary systems that includes information on the number, size, mass, and spacing of the planets around a variety of star types is needed to deepen our understanding of planetary system formation and processes that give rise to their final configurations. Recent discoveries show that many planetary systems are quite different from the solar system in that they often possess giant planets in short period orbits. The inferred evolution of these planets and their orbital characteristics imply the absence of Earth-like planets near the habitable zone. Information on the properties of the giant-inner planets is now being obtained by both the Doppler velocity and the transit photometry techniques. The combination of the two techniques provides the mass, size, and density of the planets. For the planet orbiting star HD209458, transit photometry provided the first independent confirmation and measurement of the diameter of an extrasolar planet. The observations indicate a planet 1.27 the diameter of Jupiter with 0.63 of its mass (Charbonneau et al. 1999). The results are in excellent agreement with the theory of planetary atmospheres for a planet of the indicated mass and distance from a solar-like star. The observation of the November 23, 1999 transit of that planet made by the Ames Vulcan photometer at Lick Observatory is presented. In the future, the combination of the two techniques will greatly increase the number of discoveries and the richness of the science yield. Small rocky planets at orbital distances from 0.9 to 1.2 AU are more likely to harbor life than the gas giant planets that are now being discovered. However, new technology is needed to find smaller, Earth-like planets, which are about three hundred times less massive than Jupiter-like planets. The Kepler project is a space craft mission designed to discover hundreds of Earth-size planets in and near the habitable zone around a wide variety of stars. to demonstrate that the technology exists to find such small planets, our group has conducted an end-to-end system test. The results of the laboratory tests are presented and show that we are ready to start the search for Earth-size planets.

Author

Planetary Atmospheres; Photometers; Solar System; Planetary Systems; Extrasolar Planets; Gas Giant Planets

20010084733 NASA Ames Research Center, Moffett Field, CA USA

Photodissociation Regions

Hollenbach, David J., NASA Ames Research Center, USA; [2000]; 1p; In English, 13 Jul. 2000, Cambridge, MA, USA

Contract(s)/Grant(s): RTOP 344-04-10-02; No Copyright; Avail: Issuing Activity; Abstract Only

The interstellar medium of galaxies is the reservoir out of which stars are born and into which stars inject newly created elements as they age. The physical properties of the interstellar medium are governed in part by the radiation emitted by these stars. Far-ultraviolet (6 eVis less than hNu is less than 13.6 eV) photons from massive stars dominate the heating and influence the chemistry of the neutral atomic gas and much of the molecular gas in galaxies. Predominantly neutral regions of the interstellar medium in which the heating and chemistry are regulated by far ultraviolet photons are termed Photodissociation Regions (PDRs). These regions are the origin of most of the non-stellar infrared (IR) and the millimeter and submillimeter CO emission from galaxies. The importance of PDRs has become increasingly apparent with the advances in IR and submillimeter astronomy. The IR emission from PDRs includes fine structure lines of C, C(+) and O; rovibrational lines of H₂; rotational lines of CO; broad mid-IR features of polycyclic aromatic hydrocarbons; and a luminous underlying IR continuum from interstellar dust. The transition of H to H₂ and C(+) to CO occurs within PDRs. Comparison of observations with theoretical models of PDRs enables one to determine the density and temperature structure, the elemental abundances, the level of ionization, and the radiation field. PDR models have been applied to interstellar clouds near massive stars, planetary nebulae, red giant outflows, photoevaporating planetary disks around newly formed stars, diffuse clouds, the neutral intercloud medium, and molecular clouds in the interstellar radiation field-in summary, much of the interstellar medium in galaxies. Theoretical PDR models explain the observed correlations of the [CII] 158 micrometers with the CO J=1-0 emission, the CO J=1-0 luminosity with the interstellar molecular mass, and the [CII] 158 micrometers plus [OI] 63 micrometers luminosity with the IR continuum luminosity. On a more global scale, PDR models predict the existence of two stable neutral phases of the interstellar medium, elucidate the formation and destruction of star-forming molecular clouds, and suggest radiation-induced feedback mechanisms that may regulate star formation rates and the column density of gas through giant molecular clouds.

Author

Galaxies; Interstellar Matter; Photodissociation; Mathematical Models; Massive Stars

20010084902 City Univ. of New York, NY USA

Longslit Spectra of the Galaxy NGC 1569

Duenas, Ely, City Univ. of New York, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 57-62; In English; See also 20010084895

Contract(s)/Grant(s): NCC5-116; NCC5-98; NCC5-96; NCC5-228; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Longslit spectra of the starburst galaxy NGC 1569 are displayed. This ground-based data was acquired at the 90-inch telescope of the Steward Observatory (Kitt Peak, Arizona) in September 1998. Results for the red region of the spectrum are presented. The variation of ionization and gas density as a function of position in the galaxy are shown. The background stellar component of the galaxy is separated from the nebular emission spectrum. These ground-based results will be used with space-based data to be acquired by astronomers at South Carolina State University, the University of Maryland and Rice University as part of an approved Cycle 8 Hubble Space Telescope program.

Author

Emission Spectra; Starburst Galaxies; Ionization

20010084903 Canarsie High School, Science Dept., Brooklyn, NY USA

A Standards-Based Meteorological Activities for All Students

Fried, Barry, Canarsie High School, USA; Harding, Ian, Canarsie High School, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 65-74; In English; See also 20010084895; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Canarsie High School is a typical urban high school in Brooklyn, New York. We have been involved in a District Initiative in collaboration with the City College of New York (CCNY) to initiate and incorporate relevant technologies into the science content areas and classrooms. Through changes in teaching strategies consistent with science education reform movements for mainstream, gifted and special education students; we have been able to effectively motivate student interest and to enhance and enrich the learning potential of all students. Our lessons involve extensive computer and Internet applications, concentrating our efforts in developing high-ordered reasoning skills to address the required concepts covered in Earth Science and Environmental Science curricula. This is a crucial aspect of applied learning approaches as related science concepts are integrated and clearly demonstrated in our daily lives. Our task was to infuse 'live' weather data into Earth Science and Environmental Science classrooms. Student-centered learning activities, laboratory experiences and long-term investigations were designed, written and included into classroom lessons and laboratory sections. This component is aligned with the New Learning and Performance Standards, and makes use of investigative and inquiry-based studies through technological resources. These were accomplished through data readings taken from our school weather station and various World Wide Web sites. Weather data from area "cluster" schools were also used to compare micro-climates within our local region. This fostered peer communication skills among students and staff throughout the Brooklyn High School District.

Derived from text

Education; Schools; Internets; Students; Computer Techniques

20010084994 Agilent Labs., Systems and Solutions Lab., USA

Calibration of Hubble Space Telescope Focal-Length Variations Using the Embedding Technique

Barford, Lee, Agilent Labs., USA; Tufillaro, Nicholas, Agilent Labs., USA; Usikov, Daniel, Agilent Labs., USA; Marochnik, Leonid, Computer Sciences Corp., USA; McCutcheon, Robert, Computer Sciences Corp., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 485-495; In English; See also 20010084958; No Copyright; Avail: CASI; A03, Hardcopy

A modeling method that allows one to rapidly build data-driven models of nonlinear components is discussed. The models are constructed from input/output time domain data and their 'embeddings'. The notion of models built from embedded data is described in the Taken's Embedding Theorem and has been extensively explored for modeling systems in the physics literature. The authors from Agilent Laboratories are developing practical methods to extend these results to non-autonomous systems by creating tools that allow engineers to rapidly build models for driven nonlinear components. These models can be used in simulation, process control, diagnostics, and sensor calibration. Using these methods a 'black-box' data-driven model is generated to calibrate Hubble Space Telescope (HST) focal-length changes on a 5-minute time grid for the period from 1995-1999. These models are built using a program, CHAOS, developed by Agilent Laboratories. The data-driven model predicts the focus for the measured points about 36% better than the Full-Temperature Model (FTM) constructed from a detailed knowledge of the telescope structure. As demonstrated by this HST focal-length calibration, data-driven models, such as those generated with the CHAOS package, have great potential for application to a wide spectrum of HST/Next Generation Space Telescope (NGST) calibration problems. In particular, for sensor calibration applications, blackbox nonlinear models can be generated rapidly, which have similar or better performance than models built from a detailed understanding of the system structure.

Author

Calibrating; Computerized Simulation; Focusing

20010085347 NASA Goddard Space Flight Center, Greenbelt, MD USA

High Resolution Three-Color Imaging of Spirals With Nuclear Star-Forming Rings

Mazzuca, Lisa, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; Central Kiloparsecs Starbursts and AGN, La Palma, Spain; No Copyright; Avail: Issuing Activity; Abstract Only

Nuclear rings in barred spirals offer an opportunity to study starburst properties in order to develop an understanding of the evolution of star formation in galaxies. To achieve this understanding, a large scale imaging survey in the H alpha line and in the B and I broad bands has been performed. Analysis of all galaxies that reveal nuclear rings in the H alpha line will be compared to numerical models so that the relative ages between the starforming clumps can be estimated. The luminosity function of the starforming regions will be related to the measured properties of the associated star-cluster and the required ionizing flux. Also B - I color index images will be performed to indicate the location of the dust lanes.

Author

Color; High Resolution; Imaging Techniques; Starburst Galaxies

20010089266 NASA Goddard Space Flight Center, Greenbelt, MD USA

Simulation of MEMS for the Next Generation Space Telescope

Mott, Brent, NASA Goddard Space Flight Center, USA; Kuhn, Jonathan, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA Goddard Space Flight Center (GSFC) is developing optical micro-electromechanical system (MEMS) components for potential application in Next Generation Space Telescope (NGST) science instruments. In this work, we present an overview of the electro-mechanical simulation of three MEMS components for NGST, which include a reflective micro-mirror array and transmissive microshutter array for aperture control for a near infrared (NIR) multi-object spectrometer and a large aperture MEMS Fabry-Perot tunable filter for a NIR wide field camera. In all cases the device must operate at cryogenic temperatures with low power consumption and low, complementary metal oxide semiconductor (CMOS) compatible, voltages. The goal of our simulation efforts is to adequately predict both the performance and the reliability of the devices during ground handling, launch, and operation to prevent failures late in the development process and during flight. This goal requires detailed modeling and validation of complex electro-thermal-mechanical interactions and very large non-linear deformations, often involving surface contact. Various parameters such as spatial dimensions and device response are often difficult to measure reliably at these small scales. In addition, these devices are fabricated from a wide variety of materials including surface micro-machined aluminum, reactive ion etched (RIE) silicon nitride, and deep reactive ion etched (DRIE) bulk single crystal silicon. The above broad set of conditions combine to be a formidable challenge for space flight qualification analysis. These simulations represent NASA/GSFC's first attempts at implementing a comprehensive strategy to address complex MEMS structures.

Author

Microelectromechanical Systems; Computerized Simulation; Reliability Analysis; Performance Prediction

20010089365 NASA Goddard Space Flight Center, Greenbelt, MD USA

Integrated Modeling for the Next Generation Space Telescope "Yardstick" Concept

Mosier, Gary E., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; FEMCI Workshop 2001: Innovative FEM Solutions to Challenging Problems, 16-17 May 2001, Greenbelt, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The so-called NASA "Yardstick" design concept for the Next Generation Space Telescope presents unique challenges for systems-level analysis. Simulations that integrate controls, optics, thermal, and structural models are required to evaluate baseline performance, study design sensitivities, and perform design optimization. An integrated modeling approach was chosen using a combination of commercial off-the-shelf and "in-house" developed codes. The resulting capability provides a foundation for linear and non-linear analysis, using both the time and frequency-domain methods. It readily allows various combinations of design parameters and environmental loads to be evaluated directly in terms of key science-related metrics, in this case the scalar RMS (root mean square) line-of-sight and RMS wavefront errors. This presentation first addresses the development of the component, or discipline, models for the Yardstick design. It will then proceed to present the integration of the component models, using linear-systems approaches, in order to support two of the most critical baseline performance analyses: jitter and thermal-elastic stability of the optical telescope assembly (OTA). The results of the jitter analysis indicate that disturbances from the reaction wheels coupled with the lightly-damped and highly-flexible structure present significant challenges to the baseline line-of-sight control architecture. Vibration isolation will be required to meet jitter error requirements. The results of the thermal-elastic analysis indicate that the mirror segment displacements due to ground-to-orbit cool-down of the telescope are within the expected capture range of the segment rigid-body control actuators. This means we will be able to align and phase the

primary mirror. However, the results for the analysis of the thermal transient response following an attitude maneuver (slew) show that this telescope design is not sufficiently stable, passively, to meet the wavefront error requirements. Structural re-design is one possibility; alternatively, active thermal control of the OTA may be considered. The Yardstick integrated models were successfully used to demonstrate the feasibility of two thermal control strategies.

Author

Design Analysis; Computerized Simulation; Structural Vibration; Thermal Stability

90 ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20010083764 NASA Goddard Inst. for Space Studies, New York, NY USA

Yellow Hypergiants as Dynamically Unstable Post-Red-supergiant Stars

Stothers, Richard B., NASA Goddard Inst. for Space Studies, USA; Chin, Chao-wen, NASA Goddard Inst. for Space Studies, USA; Jul. 02, 2001; 15p; In English

Report No.(s): GCN-01-30; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

According to recent theoretical studies, the majority of single stars more massive than 30 solar mass successfully evolve into red supergiants, but then lose most of their hydrogen envelopes and metamorphose into hot blue remnants. While they are cool, they become dynamically unstable as a result of high radiation pressure and partial ionization of the gases in their outer layers. It is shown here that these unstable red-supergiant models repeatedly shrink and re-expand on a thermal time scale when perturbed by heavy bursts of mass loss. Consequently, they fill up the domain of yellow hypergiants on the Hertzsprung-Russell diagram and display very fast rates of evolution there, as observed.

Author

Stellar Mass; Supergiant Stars; Stellar Activity; Stellar Color; Stellar Evolution

20010084184 NASA Ames Research Center, Moffett Field, CA USA

Dispersal of Disk Around Young Stars

DeVincenzi, Donald L., NASA Ames Research Center, USA; Hollenbach, David, NASA Ames Research Center, USA; [2000]; 1p; In English, 12 Jul. 2000, Cambridge, MA, USA

Contract(s)/Grant(s): RTOP 344-04-10-02; No Copyright; Avail: Issuing Activity; Abstract Only

Young stars produce sufficient ultraviolet photon luminosity and mechanical luminosity in their winds to significantly affect the structure and evolution of the accretion disks surrounding them. The Lyman continuum photons create a nearly static, ionized, isothermal $10(\exp 4)$ K atmosphere forms above the neutral disk at small distances from the star. Further out, they create a photoevaporative flow which relatively rapidly destroys the disk. The resulting slow (10-50 km per second) ionized outflow, which persists for greater than or equal to $10(\exp 5)$ years for disk masses M_d approx. $0.3M^*$, may explain the observational characteristics of many ultracompact HII regions. We compare model results to the observed radio free-free Spectra and luminosities of ultracompact HII regions and to the interesting source MWC349, which is observed to produce hydrogen masers. We also apply the results to the early solar nebula to explain the dispersal of the solar nebula and the differences in hydrogen content in the giant planets. Finally, we model the small bright objects ("proplyds") observed in the Orion Nebula as disks around young, low mass stars which are externally illuminated by the UV photons from the nearby massive star.

Author

Accretion Disks; Dispersing; Massive Stars; Gas Giant Planets

20010084319 Naval Academy, Annapolis, MD USA

Radiation-Induced Processing of Hydrocarbons in Environments Relevant to Pluto

Gallagher, Robert M.; May 07, 2001; 55p; In English

Report No.(s): AD-A392454; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An understanding of the formation of the larger molecules in the outer solar system, by radiation induced processing of more primitive constituents, has implications relating to the evolution of the solar system. Organic residues formed by cosmic ray irradiation on cosmic ices may also have some exobiological significance, directly relating to the process from which life began on Earth. Since Pluto is one of the most primitive, and well-preserved, bodies in the solar system, its surface chemistry is of particular relevance. This project was an attempt to correlate recent astronomical data with a radiation model for compound formation. Spectroscopic observations of Pluto suggest the presence of ethane, presumably caused by cosmic ray irradiation of

methane trapped in solid nitrogen at the surface. This project used near-infrared (NIR) spectroscopy to examine this process in laboratory analogs. Samples of nitrogen doped to appropriate low concentrations with methane and for carbon monoxide were deposited at 50 K or below, and the resulting films irradiated with varied doses of 1 MeV protons. The formation of ethane, and other products, was observed at radiation dosages consistent with levels experienced at the planet's surface. However, neither the intensity nor bandwidths of the spectroscopic signals compared very well with the NIR telescopic data. These facts lend some support to a model suggesting two different terrains on the planet, one with low methane concentration, and another with much higher levels. Irradiation of the latter might account for the ethane signals observable from Earth. The laboratory irradiation experiments also resulted in the formation of a residue, stable at high temperatures, consistent with models of organic polymer formation on icy bodies in the outer solar system. Some attempts at determining the composition of the residue were also performed.

DTIC

Infrared Spectroscopy; Hydrocarbons; Near Infrared Radiation; Cosmic Rays; Pluto (Planet); Planetary Atmospheres

20010084445 Army Research Inst. of Environmental Medicine, Natick, MA USA

Solar Load Inputs for USARIEM Thermal Strain Models and the Solar Radiation-Sensitive Components of the WBGT Index

Matthew, William T.; Santee, William R.; Berglund, Larry G.; Jun. 2001; 23p; In English

Report No.(s): AD-A392480; USARIEM-TR-T01-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes processes we have implemented to use global pyranometer-based estimates of mean radiant temperature as the common solar load input for the Scenario model, the USARIEM heat strain model, and for the computation of the solar radiation sensitive components of the Wet Bulb Globe Temperature (WBGT) index.

DTIC

Solar Radiation; Atmospheric Models; Atmospheric Temperature; Surface Temperature; Thermal Stresses

20010084722 NASA Ames Research Center, Moffett Field, CA USA

Star Formation in the Galaxy and the Fluctuating UV Radiation Field

Hollenbach, David, NASA Ames Research Center, USA; Parravano, A., NASA Ames Research Center, USA; McKee, C., NASA Ames Research Center, USA; [2000]; 1p; In English; High-Mass Star Formation: An Origin in Clusters, 24 May - 4 Jun. 2000, Volterra, Italy

Contract(s)/Grant(s): RTOP 344-04-10-02; No Copyright; Avail: Issuing Activity; Abstract Only

We examine the formation of massive stars in the Galaxy, the resultant fluctuating UV radiation field, and the effect of this Field on the star-forming interstellar medium. Following previous researchers such as Habing (1968), we calculate the average interstellar radiation field at the Solar Circle of the Galaxy. However, our new calculations follow more closely the time dependence of the field at any point. We show that there is a significant difference between the mean field and the median field, and that there are substantial fluctuations of the field (on timescales of order 100 million years) at a given point. Far Ultraviolet Radiation (FUV, photon energies of 6 eV - 13.6 eV) has been recognized as the main source of heating of the neutral interstellar gas. Given the pressure of the interstellar medium (ISM) the FUV field determines whether the thermal balance of the neutral gas results in cold (T approximately 50 - 100 K) clouds (CNM), warm (T about 10,000 K) (WNM), for a combination of the two (the two phase ISM) We present results for the time history of the FUV field for points in the local ISM of the Milky Way Galaxy. The presence of this fluctuating heating rate converts CNM to WNM and vice versa. We show how to calculate the average fractions of the gas in the CNM and WNM when the interstellar gas is subject to this fluctuating FUV field. The knowledge of how these fractions depend on the gas properties (i.e. mean density and composition) and on the FUV-sources (i.e. the star formation rate, or the IMF, or the size distribution of associations) is a basic step in building any detailed model of the large scale behavior of the ISM and the mutual relation between the ISM and the SFR.

Author

Interstellar Matter; Star Formation; Ultraviolet Radiation; Massive Stars; Interstellar Radiation; Background Radiation

20010084730 NASA Ames Research Center, Moffett Field, CA USA

H, C, N, and O Isotopic Substitution Studies of the 2165 cm (4.62 micron) "XCN" Feature Produced by UV Photolysis of Mixed Molecular Ices

Bernstein, Max P., NASA Ames Research Center, USA; Sandford, Scott A., NASA Ames Research Center, USA; Allamandola, Louis J., NASA Ames Research Center, USA; [2000]; 1p; In English

Contract(s)/Grant(s): RTOP 344-37-44-01; No Copyright; Avail: Issuing Activity; Abstract Only

To better understand the chemical species that gives rise to the 2165/cm (4.62 micron) "XCN" absorption feature seen towards embedded protostars such as W33A, we have performed laboratory studies using deuterium (H-2) isotopic labeling. We report the observation of a small but significant deuterium isotope shift for the "XCN" peak which demonstrates that the atomic motion(s) causing the "XCN" band in the laboratory samples must involve hydrogen. We also report the results of C-13, N-15 and O-18 labeling experiments that are consistent with previously reported values.

Author

Carbon 13; Hydrogen; Nitrogen 15; Deuterium; Isotopic Labeling; Protostars; Photolysis

20010084731 NASA Ames Research Center, Moffett Field, CA USA

Planet Formation and the Characteristics of Extrasolar Planets

Lissauer, Jack J., NASA Ames Research Center, USA; [2000]; 1p; In English, 21-25 Aug. 2000, Berkeley, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

An overview of current theories of planetary growth, emphasizing the formation of extrasolar planets, is presented. Models of planet formation are based upon observations of the Solar System, extrasolar planets, and young stars and their environments. Terrestrial planets are believed to grow via pairwise accretion until the spacing of planetary orbits becomes large enough that the configuration is stable for the age of the system. Giant planets begin their growth like terrestrial planets, but if they become massive enough before the protoplanetary disk dissipates, then they are able to accumulate substantial amounts of gas. These models predict that rocky planets should form in orbit about most single stars. It is uncertain whether or not gas giant planet formation is common, because most protoplanetary disks may dissipate before solid planetary cores can grow large enough to gravitationally trap substantial quantities of gas. A potential hazard to planetary systems is radial decay of planetary orbits resulting from interactions with material within the disk. Planets more massive than Earth have the potential to decay the fastest, and may be able to sweep up smaller planets in their path. The implications of the giant planets found in recent radial velocity searches for the abundances of habitable planets are discussed.

Author

Extrasolar Planets; Planetary Evolution; Protoplanetary Disks; Planetary Orbits

20010084898 South Carolina State Univ., Orangeburg, SC USA

A Study of the Planetary Nebula M57

Archie, Deithra, South Carolina State Univ., USA; Moore, Brian, South Carolina State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 37-42; In English; See also 20010084895

Contract(s)/Grant(s): NCC5-116; NCC5-96; NCC5-228; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We present an overview of the objects known as planetary nebulae. These emission nebulae are the end-product of the evolution of a dying star. Our ground-based imagery is of the most famous of these objects, M57, also known as the Ring Nebula. Taken with the 2.12-meter telescope at San Pedro Matir in Baja, Mexico, these seeing-limited images show variations in ionization, density and temperature as a function of position in the nebula. Our ground-based imagery is compared to similar HST archival images.

Author

Planetary Nebulae; Ionization; A Stars; Imagery

20010084899 City Univ. of New York, Medgar Evers Coll., Brooklyn, NY USA

A Study of H II Regions and M8

Battle, Tamara, City Univ. of New York, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 43-47; In English; See also 20010084895

Contract(s)/Grant(s): NCC5-98; NCC5-116; NCC5-96; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

We present an overview of the objects in the interstellar medium known as H II regions. These clouds of dust and gas are detected in emission throughout the plane of the galaxy, and are the site of ongoing star formation. We present imagery of one of the more famous H II regions; M8, the Lagoon Nebula. The ionization structure of the nebula is examined and our ground-based imagery is compared to HST (Hubble Space Telescope) archival images of this object.

Author

Interstellar Matter; H II Regions; Star Formation; Galaxies

20010084906 F. M. Black Middle School, Vallejo, CA USA

Do Black Holes Really Exist?

Jularbul, Audrey, F. M. Black Middle School, USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference;

November 2000, pp. 91; In English; See also 20010084895; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Do black holes really exist or is it all just imagination? "Black Holes"...that word is a mystery to all astronomers in the world. How do we know they exist? and if they do ... how do we prove that they really do? Black holes form when a star that burns out of fuel starts to collapse on its own mass for a period of time. Once this process is over, the star has squeezed all its mass into one point. This one point is called a singularity. People might not believe it but at this point both time and space stop. Black holes have been known to pull stars and other heavenly bodies into its center by its gravity. There is a limit to where nothing can escape and where nothing can get away. This invisible circle around a black hole is called the event horizon. Anything that goes past the event horizon will no doubt get sucked into the black hole. Anything beyond the event horizon will not get sucked in, but will orbit the black hole. My project centered around black holes and whether they could exist. My research concluded that very large galaxies such as NGC 3379 must contain a black hole because the stars orbiting its center are moving faster than they should and they have shifted their spectral lines to the red. The only conclusion would be that a very massive object is causing this. The only known object in the universe that would cause this would be a black hole.

Author

Black Holes (Astronomy); Event Horizon; Galaxies; Gravitation; Celestial Bodies

20010084927 South Carolina State Univ., Orangeburg, SC USA

Cosmology for Non-Science Majors

Smith, Daniel M., Jr., South Carolina State Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 95; In English; See also 20010084895; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Observational advances have considerably broadened the experimental base for cosmology (the scientific study of the formation of the universe) in recent years. NASA's Cosmic Background Explorer (COBE), the Hubble Space Telescope (HST), and very recent supernova data have given scientists glimpses of the hot universe as early as 300,000 years after the big-bang, and evidence of the galaxy formation thereafter. In spite of these dramatic observational advances, there is a perception in the lay population that study of the early universe is largely based on speculation. To help counter this notion, a new course is being developed, to be taught at South Carolina State University (SCSU), whose aim is to present the scientific evidence for the big-bang universe at a level suitable for non-science majors who have at least completed a course in pre-calculus. Course materials under development will require hands-on, active learning on the part of the student, reducing the amount of lecturing, and improving the likelihood of an effective course. Materials already available from other universities are being adapted for the SCSU course. Derived from text

Big Bang Cosmology; Cosmic Background Explorer Satellite; Hubble Space Telescope; Galactic Evolution

20010085337 California Inst. of Tech., Submillimeter Observatory, Pasadena, CA USA

Deuterium Enhancement in Water towards Orion IRC2 Deduced from HDO Lines Above 800 GHz

Pardo, Juan R., Consejo Superior de Investigaciones Cientificas, Spain; Cernicharo, Jose, Consejo Superior de Investigaciones Cientificas, Spain; Herpin, Fabrice, Consejo Superior de Investigaciones Cientificas, Spain; Kawamura, Jonathan, California Inst. of Tech., USA; Kooi, Jacob, California Inst. of Tech., USA; Phillips, Thomas G., California Inst. of Tech., USA; [2001]; 16p; In English

Contract(s)/Grant(s): NSF AST-99-80846; NSF ATM-96-16766; MCyT-AYA2000-1784

Report No.(s): Rept-2001-8; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We present the first detection of two submillimeter lines of HDO in the Kullback-Leibler divergence (KL) region of Orion: $J(\text{sub Ka,Kb}) = 1(\text{sub 1,1})$ (848.9619 GHz), and $1(\text{sub 1,1})$ to $0(\text{sub 0,0})$ (893.6387 GHz). The first line has been mapped at 10 arcseconds angular resolution. These transitions involve some of the lowest energy levels of HDO and have the shortest wavelengths accessible from the ground. Therefore they provide a perfect tool to complement previous works that made use of millimeter HDO transitions involving similar energy levels ($1(\text{sub 1,0})$ to $1(\text{sub 1,1})$ at 80.6 GHz, $2(\text{sub 1,1})$ to (sub 1,2) at 241.6 GHz, and others). The two submillimeter lines arise from the moderate expanding material or 'Plateau' ($v(\text{sub LSR}) = 9 \text{ km/s}$, Δv is greater than $= 20 \text{ km/s}$). The emission is very compact in both HDO transitions (no more extended than approximately 40-45 arcseconds) with similar intensities, lineshapes and linewidths. The Hot Core seems completely hidden in our data in contrast with the majority of other millimeter-wave observations. This fact can only be explained if the Hot Core is embedded or behind the region of the outflow. The high line opacity of the submillimeter HDO lines would then hide the Hot Core emission. A comparison with our previously published high angular resolution para-H₂O data ($3(\text{sub 1,3})$ to $2(\text{sub 2,1})$ at 183.31 GHz, and $5(\text{sub 1,5})$ to $4(\text{sub 2,2})$ at 325.15 GHz) can be performed to derive the HDO/H₂O ratio in the 'Plateau' warm molecular

environment. We have found this ratio to be in the range 0.004 to 0.01. Such a high value, taking into account that the kinetic temperature exceeds 150 K, clearly supports the idea that the observed HDO has recently evaporated from dust grain mantles.

Author

Deuterium; Water; Radio Astronomy; Thermal Emission

20010085372 Columbia Univ., Dept. of Applied physics and Applied Mathematics, New York, NY USA

Collisionless Dynamics of the Magnetosphere Final Report, 1 Jun. 1997 - 31 MAY 2000

Mauel, Michael E.; Boozer, Allen H.; Oct. 2000; 9p; In English

Contract(s)/Grant(s): F49620-97-1-0425

Report No.(s): AD-A392743; AFRL-SR-BL-TR-01-0421; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The research was motivated to understand the generation and transport of energetic particles found in laboratory, astrophysical and space plasmas. In particular, we studied the collisionless acceleration and transport of electrons driven by solar variability and the nonlinear dynamics of strong interchange instabilities. We created an "artificial radiation belt" in the laboratory, allowing the creation and study of intense interchange instabilities. Our investigations combined laboratory experimentation, computer simulation, and plasma theory. Recent measurements confirmed our self-consistent model for the nonlinear evolution of the interchange instability of hot plasma confined by dipolar magnetic fields. Additionally, we have discovered a mechanism to reduce the intensity on interchange instabilities by the application of high-frequency electromagnetic waves. Building on the knowledge gained through this research, we are conducting new investigations using support from the DOE/NSF partnership in basic plasma science. This work aims to understand the nonlinear dynamics of strong interchange instabilities in rotating dipole-confined plasma and to observe, for the first time in a single experiment, interchange instabilities excited by magnetic curvature and driven plasma convection.

DTIC

Plasma Dynamics; Plasma Physics; Collisionless Plasmas; Fluid Dynamics; Magnetospheres

20010085781 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Atomic Oxygen Abundance in Molecular Clouds: Absorption Toward Sagittarius B2

Lis, D. C., California Inst. of Tech., USA; Keene, Jocelyn, Jet Propulsion Lab., California Inst. of Tech., USA; Phillips, T. G., California Inst. of Tech., USA; Schilke, P., Max-Planck-Inst. fuer Radioastronomie, Germany; Werner, M. W., Jet Propulsion Lab., California Inst. of Tech., USA; Zmuidzinas, J., California Inst. of Tech., USA; [2001]; 18p; In English

Contract(s)/Grant(s): NSF AST-99-80846

Report No.(s): Rept-2001-7; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have obtained high-resolution (approximately 35 km/s) spectra toward the molecular cloud Sgr B2 at 63 micrometers, the wavelength of the ground-state fine-structure line of atomic oxygen (O(I)), using the ISO-LWS instrument. Four separate velocity components are seen in the deconvolved spectrum, in absorption against the dust continuum emission of Sgr B2. Three of these components, corresponding to foreground clouds, are used to study the O(I) content of the cool molecular gas along the line of sight. In principle, the atomic oxygen that produces a particular velocity component could exist in any, or all, of three physically distinct regions: inside a dense molecular cloud, in the UV illuminated surface layer (PDR) of a cloud, and in an atomic (H(I)) gas halo. For each of the three foreground clouds, we estimate, and subtract from the observed O(I) column density, the oxygen content of the H(I) halo gas, by scaling from a published high-resolution 21 cm spectrum. We find that the remaining O(I) column density is correlated with the observed (13)CO column density. From the slope of this correlation, an average $[O(I)]/[(13)CO]$ ratio of 270 ± 120 (3-sigma) is derived, which corresponds to $[O(I)]/[(13)CO] = 9$ for a CO to (13)CO abundance ratio of 30. Assuming a (13)CO abundance of 1×10^{-6} with respect to H nuclei, we derive an atomic oxygen abundance of 2.7×10^{-4} in the dense gas phase, corresponding to a 15% oxygen depletion compared to the diffuse ISM in our Galactic neighborhood. The presence of multiple, spectrally resolved velocity components in the Sgr B2 absorption spectrum allows, for the first time, a direct determination of the PDR contribution to the O(I) column density. The PDR regions should contain O(I) but not (13)CO, and would thus be expected to produce an offset in the O(I)-(13)CO correlation. Our data do not show such an offset, suggesting that within our beam O(I) is spatially coexistent with the molecular gas, as traced by (13)CO. This may be a result of the inhomogeneous nature of the clouds.

Author

Absorption Spectra; Molecular Clouds; Monatomic Gases; Oxygen; Carbon Monoxide

20010085856 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Responses of the Jovian Atmosphere to Cometary Particles and Photon Impacts *Final Report, 15 Jun. 1997 - 30 Apr. 2001*

Dalgarno, Alex, Smithsonian Astrophysical Observatory, USA; August 2001; 3p; In English

Contract(s)/Grant(s): NAG5-4986; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Detailed calculations were performed of the deposition of energetic oxygen ions into the atmosphere of Jupiter. A Monte Carlo simulation was used. Similar processes occur in other astrophysical environments to which our methods can be applied. In particular Cravens has suggested that the X-ray emissions seen from comets are due to transitions from excited states following capture of electrons by solar wind ions colliding with the atmosphere of the comet. Alternative proposals have been advanced for the source of the cometary X-rays. We have carried out a study of the spectra and have shown that with the spectral resolution of about 20 eV the different excitation mechanisms can be distinguished. The response of the two components of the solar wind predict a spectrum that is consistent with the cometary observations. X-rays from the comets arise from the slow solar wind.

Derived from text

Astrophysics; Comets; Jupiter Atmosphere; Oxygen Ions; Photons; Solar Wind; X Ray Astronomy

20010086586 Oak Ridge National Lab., Physics Div., TN USA

Nuclear Reaction Rate Uncertainties and Their Effects on Nova Nucleosynthesis Modeling

Hix, W. R.; Smith, M. S.; Mezzacappa, A.; Starrfield, S.; Smith, D. L.; 2001; 12p; In English; Original contains color illustrations Report No.(s): PB2001-106594; No Copyright; Avail: National Technical Information Service (NTIS)

The nucleosynthesis and other observable consequences of a nova outburst depend sensitively on the details of the thermonuclear runaway which initiates the outburst. One important source of uncertainty in our current models is the nuclear reaction data used as input for the evolutionary calculations. We present preliminary results of the first analyses of the impact on nova nucleosynthesis of all reaction rate uncertainties considered simultaneously.

NTIS

Nuclear Reactions; Reaction Kinetics; Models; Nuclear Fusion

20010087124 NASA Ames Research Center, Moffett Field, CA USA

Laboratory Studies of Interstellar PAH Analogs

Salama, Farid, NASA Ames Research Center, USA; [2000]; 1p; In English, 3-10 Jun. 2000, Taipei, Taiwan, Province of China; No Copyright; Avail: Issuing Activity; Abstract Only

Polycyclic aromatic hydrocarbons (PAHs) are now considered to be an important and ubiquitous component of the organic material in space. PAHs are found in a large variety of extraterrestrial materials such as interplanetary dust particles (IDPs) and meteoritic materials. PAHs are also good candidates to account for the infrared emission bands (UIRs) and the diffuse interstellar optical absorption bands (DIBs) detected in various regions of the interstellar medium. The recent observations made with the Infrared Space Observatory (ISO) have confirmed the ubiquitous nature of the UIR bands and their carriers. PAHs are thought to form through chemical reactions in the outflow from carbon-rich stars in a process similar to soot formation. Once injected in the interstellar medium, PAHs are further processed by the interstellar radiation field, interstellar shocks and energetic particles. A major, dedicated, laboratory effort has been undertaken over the past years to measure the physical and chemical characteristics of these complex molecules and their ions under experimental conditions that mimic the interstellar conditions. These measurements require collision-free conditions where the molecules and ions are cold and chemically isolated. The spectroscopy of PAHs under controlled conditions represents an essential diagnostic tool to study the evolution of extraterrestrial PAHs. The Astrochemistry Laboratory program will be discussed through its multiple aspects: objectives, approach and techniques adopted, adaptability to the nature of the problem(s), results and implications for astronomy as well as for molecular spectroscopy. A review of the data generated through laboratory simulations of space environments and the role these data have played in our current understanding of the properties of interstellar PAHs will be presented. The discussion will also introduce the newest generation of laboratory experiments that are currently being developed in order to provide a closer simulation of space environments and a better support to space missions.

Author

Interstellar Matter; Polycyclic Aromatic Hydrocarbons; Interplanetary Dust; Infrared Spectroscopy

20010087132 NASA Ames Research Center, Moffett Field, CA USA

Interstellar PAHs

Allamandola, Louis J., NASA Ames Research Center, USA; [2000]; 1p; In English; The Origin and Evolution of Interstellar PAHs, 19-23 Jun. 2000, Leiden, Netherlands

Contract(s)/Grant(s): RTOP 399-20-61; No Copyright; Avail: Issuing Activity; Abstract Only

Tremendous strides have been made in our understanding of interstellar material over the past twenty years thanks to significant, parallel developments in two closely related areas: observational astronomy and laboratory astrophysics. Twenty years ago the composition of interstellar dust was largely guessed at and the notion of abundant, gas phase, polycyclic aromatic hydrocarbons (PAHs) anywhere in the interstellar medium (ISM) considered impossible. Today the dust composition of the diffuse and dense ISM is reasonably well constrained and the spectroscopic case for interstellar PAHs, shockingly large molecules by early interstellar chemistry standards, is very strong.

Author

Interstellar Matter; Polycyclic Aromatic Hydrocarbons; Astrophysics

20010087136 California Univ., Los Angeles, CA USA

Isotopic Constraints on the Genesis of Carbonates in Martian Meteorite ALH 84001 Final Report

Leshin, Laurie A., California Univ., USA; [1999]; 2p; In English

Contract(s)/Grant(s): NAG5-7640; No Copyright; Avail: Issuing Activity; Abstract Only

Oxygen isotopic analyses in approximately 20 micrometer spots in a chemically diverse suite of carbonates from ALH 84001 show highly variable $\delta(\text{exp } 18)\text{O}$ values from +5.4 to +25.3%. The isotopic data are correlated with the major element composition of the carbonate. The earliest forming (Ca-rich) carbonates have the lowest $\delta(\text{exp } 18)\text{O}$ values and the late-forming Mg-rich carbonates have the highest $\delta(\text{exp } 18)\text{O}$ values. Two models that can explain the isotopic variation were investigated. The carbonates could have formed in a water-rich environment at relatively low, but highly variable temperatures. In this open-system case the lower limit to the temperature variation is approximately 125 C, with fluctuations of over 250 C possible within the constraints of the model, depending on fluid composition. Alternatively the data can be explained by a closed-system model in which carbonates precipitated from a limited amount of a CO_2 -rich fluid. This scenario can reproduce the range of isotopic values observed, even at relatively high temperatures (greater than 500 C). Thus, the oxygen isotopic compositions do not provide unequivocal evidence for formation of the carbonates at low temperature. Neither of these scenarios is consistent with a biological origin of the carbonates and their associated features. Olivine from ALH 84001 occurs as clusters within orthopyroxene adjacent to fractures containing disrupted carbonate globules and feldspathic shock glass. The inclusions are irregular in shape and range in size from approximately 40 micrometers to submicrometer. The olivine exhibits a limited range of chemical composition from Fo(sub 65) to Fo(sub 66). We measured $\delta(\text{exp } 18)\text{O}$ values of the olivine to be +5.1 +/- 1.4%, indistinguishable within uncertainty from the host orthopyroxene. The data suggest that the olivine formed at high temperature (greater than 800 C), and is probably unrelated to carbonate formation. Instead the olivine probably formed by metamorphic reactions involving either dehydration of hydrous silicates or reduction of opx + spinel. If the reactions took place after carbonate formation, they could have caused devolatilization of siderite, producing the magnetite in the ALH carbonate globules. This scenario is also inconsistent with a biological origin for the features in ALH 84001.

Author

SNC Meteorites; Carbonates; Meteoritic Composition; Oxygen Isotopes

20010087780 Los Alamos National Lab., NM USA

Determining the Mass of the Universe

Warren, M. S.; Bromley, B. C.; Laflamme, R.; Zurek, W. H.; Salmon, J.; 2001; 12p; In English; See also DE96611108

Report No.(s): DE2001-768174; LA-UR-00-3978; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We have developed the tools that many significantly improve the measurements of the mass of the Universe. We have performed state-of-the-art numerical simulations that provide complete dynamical information about both galaxies and dark matter, and our work has shown that the usual treatment of galaxies as point masses is unjustified. Additionally, we have proposed a method to determine the cosmic mass density from redshift-space distortions induced by large-scale flows in the presence of nonlinear clustering.

NTIS

Universe; Cosmology; Mass Distribution; Stellar Mass

20010087781 Los Alamos National Lab., NM USA

Structure of the ZZ Ceti Stars L19-2 and GD165

Bradley, P. A.; December 2001; 12p; In English

Report No.(s): DE2001-768172; LA-UR-00-3975; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We infer the structure of the ZZ Ceti stars L 19-2 and GD 165 by comparing the observed periods with periods predicted from an extensive grid of evolutionary white dwarf models. The observed period structure of these two stars is similar, and the models for both stars have a helium layer mass of about $10^{-2}M_{\odot}$ and a hydrogen layer mass of about 10^{-4} to the minus 4th power M_{\odot} . The

core of these models is 20:80 C/O that extends to 0.60 to 0.65 approximately with a linear ramp to pure carbon by 0.901 moles. The differences in the observed effective temperature, log g, and periods imply different stellar masses for these two stars. L 19-2 has a favored stellar mass of 0.72M and GD 165 has a favored stellar mass range of 0.65 to 0.681.

NTIS

Stellar Models; White Dwarf Stars

20010087790 Ships Parts Control Center, Mechanicsburg, PA USA

The Interactions of Contamination Products with the Space Environment: In-Situ Electron Spectroscopy Studies of UV-Irradiated Silicones *Final Report*

Gouzman, Irina; Grossman, Eitan; Noter, Yoram; Lifshitz, Yeshayahu; Jun. 2001; 25p; In English

Contract(s)/Grant(s): F61775-00-WE074

Report No.(s): AD-A392857; SPC-00-4074; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report results from a contract tasking SOREQ Nuclear Research Center as follows: The contractor shall investigate the exposure of spacecraft materials to a simulated low earth orbit environment. The contractor will expose self-prepared silicon polymer samples to a controlled environment of atomic oxygen and UV radiation in their test facility. After each exposure the contractor will use electron spectroscopy to determine the material degradation. The contractor will be paid \$5,000 after receipt and acceptance of an initial test plan and the remaining \$10,000 after receipt and acceptance of the final report, due 7 months after starting the effort.

DTIC

Contamination; Electron Spectroscopy; Ultraviolet Radiation; Silicones; Electron Irradiation

20010088385 NASA Ames Research Center, Moffett Field, CA USA

Molecular Spectroscopy in Astrophysics: The Case of Polycyclic Aromatic Hydrocarbons

Salama, Farid, NASA Ames Research Center, USA; [2000]; 17p; In English; EUCMOSXXV Conference on Molecular Spectroscopy, 27 Aug. - 1 Sep. 2000, Coimbra, Portugal

Contract(s)/Grant(s): RTOP 344-01-57-41; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The role of molecular spectroscopy in astrophysics and astrochemistry is discussed in the context of the study of large, complex, carbon-bearing molecules, namely, Polycyclic Aromatic Hydrocarbons or PAHs. These molecular species are now thought to be widespread in the interstellar medium in their neutral and ionized forms. Identifying the carriers responsible for unidentified interstellar spectral bands will allow to derive important information on cosmic elemental abundances as well as information on the physical conditions (density, temperature) reigning in specific interstellar environments. These, in turn, are key elements for a correct understanding of the energetic mechanisms that govern the origin and the evolution of the interstellar medium. A multidisciplinary approach - combining astronomical observations with laboratory simulations and theoretical modeling - is required to address these complex issues. Laboratory spectra of several PAHs, isolated at low temperature in inert gas matrices or seeded in a supersonic jet expansion, are discussed here and compared to the astronomical spectra of reddened, early type, stars. The electronic spectroscopy of PAHs in the ultraviolet, visible, and near-infrared domains is reviewed and an assessment of the potential contribution of PAHs to the interstellar extinction in the ultraviolet and in the visible is discussed.

Author

Interstellar Matter; Molecular Spectroscopy; Polycyclic Aromatic Hydrocarbons; Astrophysics; Diffuse Interstellar Bands

20010089283 NASA Goddard Inst. for Space Studies, New York, NY USA

Instability Regions in the Upper HR Diagram

deJager, Cornelis, Space Research Organization Netherlands, Netherlands; Lobel, Alex, Harvard-Smithsonian Center for Astrophysics, USA; Nieuwenhuijzen, Hans, Space Research Organization Netherlands, Netherlands; Stothers, Richard, NASA Goddard Inst. for Space Studies, USA; Jul. 02, 2001; 14p; In English

Report No.(s): GCN-01-32; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The following instability regions for blueward evolving supergiants are outlined and compared: (1) Areas in the Hertzsprung-Russell(HR) diagram where stars are dynamically unstable. (2) Areas where the effective acceleration in the upper part of the photospheres is negative, hence directed outward. (3) Areas where the sonic points of the stellar wind (Where wind velocity = sound velocity) are situated inside the photospheres, at a level deeper than $\tau(\text{sub Ross}) = 0.01$. We compare the results with the positions of actual stars in the HR diagram and we find evidence that the recent strong contraction of the yellow hypergiant HR8752 was initiated in a period during which ($g(\text{sub eff})$) is less than 0, whereupon the star became dynamically unstable. The

instability and extreme shells around IRC+10420 are suggested to be related to three factors: ($g_{\text{sub eff}}$) is less than 0; the sonic point is situated inside the photosphere; and the star is dynamically unstable.

Author

Hertzsprung-Russell Diagram; Supergiant Stars; Stellar Interiors; Stellar Evolution; Stellar Atmospheres; Stellar Physics; Dynamic Stability

91

LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20010084183 NASA Ames Research Center, Moffett Field, CA USA

Life On Mars: Past, Present and Future

McKay, Christopher P., NASA Ames Research Center, USA; [2000]; 1p; In English; Astrobiology Miniworkshop, 25-26 Sep. 2000, Madrid, Spain

Contract(s)/Grant(s): RTOP 344-38-82-04; No Copyright; Avail: Issuing Activity; Abstract Only

Mars appears to be cold dry and dead world. However there is good evidence that early in its history it had liquid water, more active volcanism, and a thicker atmosphere. Mars had this earth-like environment over three and a half billion years ago, during the same time that life appeared on Earth. The main question in the exploration of Mars then is the search for a independent origin of life on that planet. Ecosystems in cold, dry locations on Earth - such as the Antarctic - provide examples of how life on Mars might have survived and where to look for fossils. Although the Viking results may indicate that Mars has no life today, there is direct geomorphological evidence that, in the past, Mars had large amounts of liquid water on its surface - possibly due to a thicker atmosphere. From a biological perspective the existence of liquid water, by itself motivates the question of the origin of life on Mars. One of the martian meteorites dates back to this early period and may contain evidence consistent with life. From studies of the Earth's earliest biosphere we know that by 3.5 Cyr. ago, life had originated on Earth and reached a fair degree of biological sophistication. Surface activity and erosion on Earth make it difficult to trace the history of life before the 3.5 Cyr timeframe. Ecosystems in cold, dry locations on Earth - such as the Antarctic - provide examples of how life on Mars might have survived and where to look for fossils. Human exploration of Mars will probably begin with a small base manned by a temporary crew, a necessary first start. But exploration of the entire planet will require a continued presence on the Martian surface and the development of a self sustaining community in which humans can live and work for very long periods of time. A permanent Mars research base can be compared to the permanent research bases which several nations maintain in Antarctica at the South Pole, the geomagnetic pole, and elsewhere. In the long run, a continued human presence on Mars will be the most economical way to study that planet in detail. It is possible that at some time in the future we might recreate a habitable climate on Mars, returning it to the life-bearing state it may have enjoyed early in its history. Our studies of Mars are still in a preliminary state but everything we have learned suggests that it may be possible to restore Mars to a habitable climate.

Author

Extraterrestrial Life; Mars (Planet); Biological Evolution; Climatology; Geomorphology

20010084314 NASA Ames Research Center, Moffett Field, CA USA

On the Stability of Liquid Water on Present Day Mars

Haberle, Robert M., NASA Ames Research Center, USA; [2000]; 1p; In English; Mars Global Surveyor Workshop, 11-16 Jun. 2000, Boulder, CO, USA

Contract(s)/Grant(s): RTOP 624-05-04; No Copyright; Avail: Issuing Activity; Abstract Only

The mean annual surface pressure and temperature on present day Mars do not allow for the long term stability of liquid water on the surface. However, theoretical arguments have been advanced that suggest liquid water could form in transient events even though it would not be in equilibrium with the environment. Using a Mars General Circulation Model, we calculate where and for how long the surface pressure and surface temperature meet the minimum requirements for this metastability of liquid water. These requirements are that the pressure and temperature must be above the triple point of water, but below its boiling point. We find that there are five regions on Mars where these requirements are periodically satisfied: in the near equatorial regions of Amazonis, Arabia, and Elysium, and in the Hellas and Argyre impact basins. Whether liquid water ever forms in these regions depends on the availability of ice and heat, and on the evaporation rate. The latter is poorly understood for low pressure CO₂ environments, but is likely to be so high that melting occurs rarely, if at all. However, in the relatively recent past, surface pressures may have been higher than they are today perhaps by as much as a factor of 2 or 3. Under these circumstances melting would have

been easier to achieve. We plan to undertake laboratory experiments to better understand the potential for melting in low pressure environments.

Author

Surface Temperature; Planetary Temperature; Mars Surface; Atmospheric General Circulation Models; Metastable State; Water; Liquid Surfaces

20010084647 NASA Ames Research Center, Moffett Field, CA USA

Mars Sample Return: A Low Cost, Direct and Minimum Risk Design

Wercinski, Paul F., NASA Ames Research Center, USA; [1994]; 1p; In English; AIAA/AAS Astrodynamics Conference, 1-3 Aug. 1994, Scottsdale, AZ, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 232-01-04; No Copyright; Avail: Issuing Activity; Abstract Only

Current NASA strategy for Mars exploration is seeking simpler, cheaper, and more reliable missions to Mars. This requirement has left virtually all previously proposed Mars Sample Return (MSR) missions as economically untenable. The MSR mission proposed in this paper represents an economical, back-to-basics approach of mission design by leveraging interplanetary trajectory design and limited surface science for shorter mission duration, advanced propulsion and thermal protection systems for mass reduction and simplified mission operations for high reliability. As a result, the proposed concept, called the Fast, Mini, Direct Mars Sample Return (FMD-MSR) mission represents the cheapest and fastest class of missions that could return a 0.5 kg sample from the surface of Mars to Earth with a total mission duration of less than 1.5 Earth years. The constraints require an aggressive mission design that dictates the use of advanced storable liquid propulsion systems and advanced TPS materials to minimize aeroshell mass. The mission does not have the high risk operations of other MSR missions such as orbit rendezvous at Mars, propulsive insertion at Mars, rover operations on the surface, and sample transfer. This paper details the key mission elements for such a mission and presents a feasible and cost effective design.

Author

Cost Effectiveness; Mars Sample Return Missions; Mission Planning; Design Analysis; Risk; Propulsion System Configurations; Propulsion System Performance

20010084732 NASA Ames Research Center, Moffett Field, CA USA

Effect of Negative Ions on the Conductivity of the Titan Atmosphere

Borucki, W. J., NASA Ames Research Center, USA; Bakes, E., Search for Extraterrestrial Intelligence Inst., USA; Whitten, R. C., Raytheon Co., USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

In an earlier paper, Borucki et al (1987) calculated the electrical conductivity and electrical charge on aerosols in Titan's atmosphere due to the ionization by galactic cosmic rays and electron precipitation from Saturn's magnetosphere. The lower atmosphere was predicted to be substantially more conducting than the atmospheres of Earth and Venus because of the high concentration of free electrons. The prediction of a high conductivity is based on the lack of electrophillic species which form negative ions with low mobility and which reduce the number of free electrons. At that time, no molecular species capable of forming negative ions in concentrations sufficient to perturb the atmospheric conductivity were identified. Recently, E. Bakes and her colleagues have been investigating the formation of nitrogenous macromolecules using quantum mechanical methods. Their calculations indicate that the molecules will be highly electrophillic and are likely to be present in the atmosphere at mixing ratios of order $10(\exp -7)$. This mixing ratio is sufficiently large that a substantial reduction in the conductivity is expected at altitudes below 100 km. Revision of the atmospheric model to accommodate the presence of negative ions and to increase the fidelity of the modeling will be described.

Author

Negative Ions; Titan; Atmospheric Conductivity; Galactic Cosmic Rays; Electrical Resistivity

20010084791 NASA Ames Research Center, Moffett Field, CA USA

A Theoretical Investigation of the Infrared Spectroscopic Properties of Closed-Shell Polycyclic Aromatic Hydrocarbon Cations

Hudgins, Douglas M., NASA Ames Research Center, USA; Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Allamandola, Louis J., NASA Ames Research Center, USA; [2000]; 1p; In English; Observation, Analysis and Theory of Astronomical and Laboratory Spectra, 6-8 Sep. 2000, Canterbury, UK; No Copyright; Avail: Issuing Activity; Abstract Only

Density functional theory has been employed to calculate the harmonic frequencies and intensities of a range of PAH cations which explore both size and electronic structure effects on the infrared spectroscopic of these species. The sample extends the size range of PAH species considered to more than 50 carbon atoms and includes several representatives from each of two heretofore unexplored categories of PAH cations: (1) fully benzenoid PAH cations whose carbon skeleton is composed of an odd

number of carbon atoms and (2) protonated PAH cations. Unlike the radical electronic structures of the PAH cations that have been the subject of previous theoretical and experimental work, the species in these two classes have a closed-shell electronic configuration. The calculated spectra of circumcoronene, C₅₄H₁₈, in both neutral and (radical) cationic form are also reported and compared to those of the other species. Closed-shell species are inherently less reactive than radical (or open-shell) cations and are known to play a role in combustion chemistry. Since interstellar PAHs are typically exposed to abundant atomic hydrogen and are thought to originate under pseudo-combustion conditions in carbon-rich circumstellar shells, such species may represent an important component of the interstellar PAH population. Furthermore, species larger than 50 carbon atoms are more representative of the size of the typical interstellar PAH. Overall, as has been the case for previous studies of PAH radical cations, the general pattern of band positions and intensities are consistent with that of the interstellar infrared emission spectrum. In addition, the spectra of closed-shell and open-shell cations are found to converge with increasing molecular size and are found to be relatively similar for species containing about 50 carbon atoms.

Author

Cations; Infrared Spectroscopy; Polycyclic Aromatic Hydrocarbons; Radicals; Combustion Chemistry

20010084916 California Univ., Dept. of Physics, Santa Barbara, CA USA

The MESSENGER Orbiter Mission to Mercury

Peale, S. J., California Univ., USA; Materials Presented at the MU-SPIN Ninth Annual Users' Conference; November 2000, pp. 137-145; In English; See also 20010084895; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

MESSENGER is a MErcury Surface, Space ENvironment, GEochemistry and Ranging mission to orbit the planet Mercury for one Earth year following two flybys of that planet and two flybys of Venus. Here we point out the major science questions about Mercury that will be addressed by measurements from seven major instruments on the spacecraft along with the radio tracking. The Science Team for the mission is presented along with each team member's responsibilities showing the wide range of expertise necessary to accomplish the mission objectives. Methods of participation in the mission by members of the scientific community not on the Science Team and not otherwise associated with the mission are indicated.

Author

Aerospace Environments; Space Missions; Mercury (Planet); Mercury Surface; Rangefinding

20010085344 NASA Goddard Space Flight Center, Greenbelt, MD USA

HST/STIS Visible Images of Io in Eclipse

Oliversen, Ron J., NASA Goddard Space Flight Center, USA; Retherford, K. D., Johns Hopkins Univ., USA; Smyth, W. H., Atmospheric and Environmental Research, Inc., USA; Scherb, F., Wisconsin Univ., USA; Morgenthaler, J. P., Wisconsin Univ., USA; [2001]; 1p; In English; Planet, Satellites and Magnetosphere Conference, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

On 1999 August 27, Io was observed with HST STIS/CCD using a 2"x 2" aperture soon after it entered into eclipse (CML = 342 to 346). Two G750M/I spectral images, covering 5815 Angstroms to 6380 Angstroms and starting 3 and 17 minutes after 2nd contact, recorded emissions of Na I 5890,5896 Angstroms and [O I] 6300,6364 Angstroms. The oxygen and sodium emissions show several similar features. (1) Downstream wake emission that correlates in location with jovian magnetic field orientation; (2) Enhanced emissions near the sub-jovian region, albeit a relatively weak enhancement for sodium; and (3) Limb glow that is brighter in the hemisphere facing the jovian magnetic equator. These features are qualitatively similar to [O I] 6300 Angstrom images obtained with HST WFPC2 and to the UV STIS results of Roesler et al. 1999 (Science, 283, 353), as well as broadband images taken by the Galileo SSI (Geissler et al. JGR submitted) and more recent Cassini images. The integrated oxygen (6300 Angstrom + 6364 Angstrom) emission intensity (10.5 k Rayleighs (kR) disk averaged) did not change between the two exposures while the integrated disk averaged sodium D emission intensity decreased by 19% from 5.7 kR to 4.6 kR. Also, in contrast to the oxygen emission, sodium showed relatively enhanced emission in the northern polar regions. Likewise, on 1999 August 23, Io eclipse STIS observations were made in the near-UV and blue regions to try to identify the Galileo SSI violet filter emissions. Preliminary analysis reveals a residual signal after subtraction of a dominant scattered light background that is suggestive of a SO₂ band structure. In addition, the largest individual emission at about 4075 Angstrom could be the S(+) doublet.

Author

Eclipses; Io; Galileo Spacecraft; Visible Spectrum

20010086234 Space Physics Research Inst., Sunnyvale, CA USA

Model Atmospheres and Spectra for Extrasolar Giant Planets Final Report, 15 Jun. 1997 - 14 Jun. 2000

Freedman, Richard S., Space Physics Research Inst., USA; [2000]; 4p; In English

Contract(s)/Grant(s): NAG5-4970; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In the past few years much new observational data has become available for brown dwarfs and extra solar planets. Not only are new objects being discovered but the availability of higher resolution spectra is improving. This allows a better comparison between the models and the available data, and places new constraints on the models which now have to be made more physically realistic in order to better interpret the observations. Under this grant, an array of new opacities were calculated and successfully applied to a variety of physical situations that were used as input to model available observations of brown dwarfs and extra solar giant planets.

Author

Brown Dwarf Stars; Extrasolar Planets; Opacity; Spectrum Analysis; Astronomical Models; Applications Programs (Computers)

20010087014 Atmospheric and Environmental Research, Inc., Lexington, MA USA

Studies for the 3-Dimensional Structure, Composition, and Dynamic of Io's Atmosphere Annual Report, 19 May 2000 - 18 May 2001

Smyth, William H., Atmospheric and Environmental Research, Inc., USA; Aug. 31, 2001; 9p; In English

Contract(s)/Grant(s): NASW-99016

Report No.(s): P-824; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Research work is discussed for the following: (1) the exploration of new H and Cl chemistry in Io's atmosphere using the already developed two-dimensional multi-species hydrodynamic model of Wong and Smyth; and (2) for the development of a new three-dimensional multi-species hydrodynamic model for Io's atmosphere.

Author

Io; Atmospheric Chemistry; Satellite Atmospheres

20010087125 NASA Ames Research Center, Moffett Field, CA USA

The Decomposition of Carbonates and Organics on Mars

Quinn, Richard C., Search for Extraterrestrial Intelligence Inst., USA; Zent, Aaron, NASA Ames Research Center, USA; McKay, Chris, NASA Ames Research Center, USA; [2000]; 1p; In English; NASA Ames Astrobiology Science Conference, 3-5 Apr. 2000, Moffett Field, CA, USA

Contract(s)/Grant(s): NCC2-1153; No Copyright; Avail: Issuing Activity; Abstract Only

The return and analysis of pristine material that is relict of a putative period of chemical evolution is a fundamental goal of the exobiological exploration of Mars. In order to accomplish this objective, it is desirable to find oxidant-free regions where pristine material can be accessed at the shallowest possible depth (ideally directly from the surface). The objective of our ongoing research is to understand the spatial and temporal distribution of oxidants in the martian regolith and the redox chemistry of the soil; in effect to understand the chemical mechanisms and kinetics relating to the in-situ destruction of organics and the formation of the reactive species responsible for the Viking biology results. In this work, we report on experimental studies of oxidizing processes that may contribute to carbonate and organic degradation on Mars. Organic molecules directly exposed to solar UV may decomposed either directly into CO₂, or into more volatile organic fragments. Organic macromolecules not directly exposed to high UV flux are most likely to be affected by atmospheric oxidants which can diffuse to their surfaces. The oxidizing processes examined include: gas-phase oxidants, UV photolysis, and UV-assisted heterogeneous catalysis. For example, assuming a meteoritic infall rate of $4 \times 10(\exp -4) \text{ g/m}^2\text{yr}$ (Flynn and McKay 1990) and a flux of organic carbon of $2 \times 10(\exp -5) \text{ g/m}^2\text{yr}$, laboratory measurements of the UV-assisted decomposition of benzenhexacarboxylic acid (mellitic acid, a likely intermediate of kerogen oxidation), indicate its decomposition rate on Mars would exceed the total flux of organic carbon to the planet by over four orders of magnitude. Our measurements indicate that although the decomposition temperature of kerogens in some cases exceeds the temperature limit of the Viking GCMS, it is unlikely kerogens or their decomposition intermediates were present at the Viking landings sites at levels above the GCMS detection limits.

Author

Carbonates; Decomposition; Exobiology; Mars Surface; Planetary Geology; Organic Compounds

20010087149 NASA Goddard Space Flight Center, Greenbelt, MD USA

An Improved Solution of the Gravity Field of Mars (GMM-2B) from Mars Global Surveyor

Lemoine, Frank G., NASA Goddard Space Flight Center, USA; Smith, David E., NASA Goddard Space Flight Center, USA; Rowlands, David D., NASA Goddard Space Flight Center, USA; Zuber, M. T., Massachusetts Inst. of Tech., USA; Neumann, G. A., Massachusetts Inst. of Tech., USA; Chinn, D. S., Raytheon Information Technology and Scientific Services, USA; Pavlis, D. E., Raytheon Information Technology and Scientific Services, USA; [2001]; ISSN 0148-0227; 44p; In English; Original contains color illustrations

Report No.(s): Paper-2000JE001426; Copyright; Avail: Issuing Activity

A spherical harmonic solution of the Mars gravity field to degree and order 80, Goddard Mars Model 2B (GMM-2B), has been developed using X band tracking data of Mars Global Surveyor (MGS) from October 1997 to February 2000 and altimeter crossovers formed from the Mars Orbiter Laser Altimeter (MOLA) data between March and December 1999. During the mapping mission, MGS was located in a near-polar (92.9 deg. inclination) and near-circular orbit at a mean altitude of 400 km. The tracking data from this orbit provide a detailed, global, and high resolution view of the gravity field of Mars. Mars gravity solutions are stable to 60 x 60 even without application of a Kaula power law constraint. The Valles Marineris is resolved distinctly with lows reaching -450 mGals. Olympus Mons and its aureole are both separately resolved, and the volcano has a peak anomaly of 2950 mGals. The global correlation of the GMM-2B gravity coefficients with MOLA-derived topography is 0.78 through degree 60, and the correlation remains above 0.6 through degree 62. The global gravity anomaly error predicted from the GMM-2B error covariance through 60 x 60 is 11 mGal. The global geoid error from GMM-2B through 60 x 60 is 1.8 m. MGS orbit quality using GMM-2B, as measured by overlapping orbital arcs, is 1 m in the radial direction and 10 m in total position.

Author

Gravitational Fields; Mars Global Surveyor; Mars Surface; Space Exploration; Mars Atmosphere; Atmospheric Models; Data Reduction

20010089140 NASA Ames Research Center, Moffett Field, CA USA

Use of Spacecraft Data to Drive Regions on Mars where Liquid Water would be Stable

Lobitz, Brad, Johnson Controls World Services, USA; Wood, Byron L., NASA Ames Research Center, USA; Averner, Maurice M., NASA Ames Research Center, USA; McKay, Christopher P., NASA Ames Research Center, USA; MacElroy, Robert D., NASA Ames Research Center, USA; [2001]; 14p; In English

Contract(s)/Grant(s): RTOP 121-50-50; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Combining Viking pressure and temperature data with Mars Orbital Laser Altimeter (MOLA) topography data we have computed the fraction of the martian year during which pressure and temperature allow for liquid water to be stable on the martian surface. We find that liquid water would be stable within the Hellas and Argyre basin and over the northern lowlands equatorward of about 40 degrees. The location with the maximum period of stable conditions for liquid water is in the southeastern portion of Utopia Planitia where 34% of the year liquid water would be stable if it was present. Locations of stability appear to correlate with the distribution of valley networks.

Author

Mars Surface; Mars Environment; Water; Moisture Content; Pressure; Surface Temperature; Weathering; Mars Exploration; Climate; Data Systems; Liquid Surfaces

20010089224 NASA Goddard Space Flight Center, Greenbelt, MD USA

Light Isotopes and Trace Organics Analysis of Mars Samples with Mass Spectrometry

Mahaffy, P., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; MEPAG Workshop, 15-16 Aug. 2001, Pasadena, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Precision measurement of light isotopes in Mars surface minerals and comparison of this isotopic composition with atmospheric gas and other, well-mixed reservoirs such as surface dust are necessary to understand the history of atmospheric evolution from a possibly warmer and wetter Martian surface to the present state. Atmospheric sources and sinks that set these ratios are volcanism, solar wind sputtering, photochemical processes, and weathering. Measurement of a range of trace organic species with a particular focus on species such as amino acids that are the building blocks of terrestrial life are likewise important to address the questions of prebiotic and present or past biological activity on Mars. The workshop topics "isotopic mineralogy" and "biology and pre-biotic chemistry" will be addressed from the point of view of the capabilities and limitations of insitu mass spectrometry (MS) techniques such as thermally evolved gas analysis (TEGA) and gas chromatography (GC) surface experiments using MS, in both cases, as a final chemical and isotopic composition detector. Insitu experiments using straightforward adaptations of existing space proven hardware can provide a substantial improvement in the precision and accuracy of our present knowledge of isotopic composition both in molecular and atomic species in the atmosphere and those chemically bound in rocks and soils. Likewise, detection of trace organic species with greatly improved sensitivity from the Viking GCMS experiment is possible using gas enrichment techniques. The limits to precision and accuracy of presently feasible insitu techniques compared to laboratory analysis of returned samples will be explored. The insitu techniques are sufficiently powerful that they can provide a high fidelity method of screening samples obtained from a diverse set of surface locations such as the subsurface or the interior of rocks for selection of those that are the most interesting for return to Earth.

Author

Trace Elements; Mass Spectroscopy; Isotopes; Atmospheric Composition; Mars Surface Samples

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

20010084313 NASA Ames Research Center, Moffett Field, CA USA

Interaction of the Local Interstellar Medium with the Heliosphere: Role of the Interior and Exterior Magnetic Fields

Barnes, Aaron, NASA Ames Research Center, USA; [2000]; 1p; In English; COSPAR 2000 Coloquim, 24-28 Jul. 2000, Potsdam, Germany

Contract(s)/Grant(s): RTOP 370-16-01-14; No Copyright; Avail: Issuing Activity; Abstract Only

A complete model of the global interaction between the solar wind and the local interstellar medium must take account of interstellar neutral atoms, interstellar ionized gas, solar and galactic magnetic fields, galactic and anomalous cosmic rays. For now, however, in view of the many uncertainties about conditions in the interstellar medium, etc., all models must be regarded as highly idealized and incomplete. In the present review I concentrate on the role of magnetic fields of solar and interstellar origin. The former, the interior field, has negligible influence on the unshocked solar wind; the immediate post-shock solar wind is probably low-beta, so that the interior magnetic field is still unimportant, but this situation changes as the plasma flows through the heliosheath, and a ridge of strong magnetic field may form to separate materials of polar and equatorial origin. The exterior (interstellar) field is likely to play an important role in determining the global morphology of the system outside the termination shock. If the exterior field is strong enough, it can compress the heliosphere (although exterior neutral and/or ionized hydrogen may play the dominant role). Even if the interstellar magnetic field does not provide the dominant pressure, its orientation can substantially affect the configuration of the heliosphere, especially the location and orientation of the heliospheric discontinuities. The configurations can be quite different for the situations in which the field and flow are (a) aligned or (b) transverse. Obliquity of the field produces asymmetry in the geometry of the system; in particular the noses of heliopause and interstellar bow shock are shifted away from the interstellar flow direction, and in opposite directions, due to the asymmetric draping of the magnetic field.

Author

Interstellar Magnetic Fields; Heliosphere; Magnetohydrodynamic Flow; Solar Wind; Interstellar Matter; Magnetic Fields

20010084959 AI Solutions, Inc., Lanham, MD USA

Solar Activity Forecasting for use in Orbit Prediction

Schatten, Kenneth, AI Solutions, Inc., USA; 2001 Flight Mechanics Symposium; June 2001, pp. 1-14; In English; See also 20010084958

Contract(s)/Grant(s): GS-35F-4899G; NASA Order S-37707-G; No Copyright; Avail: CASI; A03, Hardcopy

Orbital prediction for satellites in low Earth orbit (LEO) or low planetary orbit depends strongly on exospheric densities. Solar activity forecasting is important in orbital prediction, as the solar UV and EUV inflate the upper atmospheric layers of the Earth and planets, forming the exosphere in which satellites orbit. Geomagnetic effects also relate to solar activity. Because of the complex and ephemeral nature of solar activity, with different cycles varying in strength by more than 100%, many different forecasting techniques have been utilized. The methods range from purely numerical techniques (essentially curve fitting) to numerous oddball schemes, as well as a small subset, called 'Precursor techniques.' The situation can be puzzling, owing to the numerous methodologies involved, somewhat akin to the numerous ether theories near the turn of the last century. Nevertheless, the Precursor techniques alone have a physical basis, namely dynamo theory, which provides a physical explanation for why this subset seems to work. I discuss this solar cycle's predictions, as well as the Sun's observed activity. I also discuss the SODA (Solar Dynamo Amplitude) index, which provides the user with the ability to track the Sun's hidden, interior dynamo magnetic fields. As a result, one may then update solar activity predictions continuously, by monitoring the solar magnetic fields as they change throughout the solar cycle. This paper ends by providing a glimpse into what the next solar cycle (#24) portends.

Author

Dynamo Theory; Exosphere; Forecasting; Solar Activity Effects; Solar Cycles

20010086596 NASA Marshall Space Flight Center, Huntsville, AL USA

Coronal Heating and the Magnetic Flux Content of the Network

Falconer, D. A., NASA Marshall Space Flight Center, USA; Moore, R. L., NASA Marshall Space Flight Center, USA; Porter, J. G., NASA Marshall Space Flight Center, USA; Hathaway, D. H., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; American Geophysical Union Meeting, 28 May - 2 Jun. 2001, Boston, MA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Previously, from analysis of SOHO/EIT coronal images in combination with Kitt Peak magnetograms (Falconer et al 1998, ApJ, 501, 386-396), we found that the quiet corona is the sum of two components: the e-scale corona and the coronal network. The large-scale corona consists of all coronal-temperature ($T \approx 10^{6.5}$ K) structures larger than supergranules ($> 30,000$ km). The coronal network (1) consists of all coronal-temperature structures smaller than supergranules, (2) is rooted in and loosely traces the photospheric magnetic network, (3) has its brightest features seated on polarity dividing lines (neutral lines) in the network magnetic flux, and (4) produces only about 5% of the total coronal emission in quiet regions. The heating of the coronal network is apparently magnetic in origin. Here, from analysis of EIT coronal images of quiet regions in combination with magnetograms of the same quiet regions from SOHO/MDI and from Kitt Peak, we examine the other 95% of the quiet corona and its relation to the underlying magnetic network. We find: (1) Dividing the large-scale corona into its bright and dim halves divides the area into bright "continents" and dark "oceans" having spans of 2-4 supergranules. (2) These patterns are also present in the photospheric magnetograms: the network is stronger under the bright half and weaker under the dim half. (3) The radiation from the large-scale corona increases roughly as the cube root of the magnetic flux content of the underlying magnetic network. In contrast, Fisher et al (1998, ApJ, 508, 985-998) found that the coronal radiation from an active region increases roughly linearly with the magnetic flux content of the active region. We assume, as is widely held, that nearly all of the large-scale corona is magnetically rooted in the network. Our results, together with the result of Fisher et al (1999), suggest that either the coronal heating in quiet regions has a large non-magnetic component, or, if the heating is predominantly produced via the magnetic field, the mechanism is significantly different than in active regions. This work is funded by NASA's Office of Space Science through the Solar Physics Supporting Research and Technology Program and the Sun-Earth Connection Guest Investigator Program.

Author

Magnetic Flux; Coronas; Heating; Magnetic Fields

20010088237 Science Applications International Corp., San Diego, CA USA

Global Magnetohydrodynamic Modeling of the Solar Corona *Progress Report, 30 Dec. 2000 - 29 Mar. 2001*

Linker, Jon A., Science Applications International Corp., USA; Aug. 21, 2001; 6p; In English; Original contains color illustrations
Contract(s)/Grant(s): NASW-98030

Report No.(s): SAIC-01/8007:APPAT-274; Rept-01-0157-04-1503-000; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report describes the progress made in the investigation of the solar corona using magnetohydrodynamic (MHD) simulations. Coronal mass ejections (CME) are believed to be the primary cause of nonrecurrent geomagnetic storms and these have been investigated through the use of three-dimensional computer simulation.

CASI

Solar Corona; Coronal Mass Ejection; Magnetohydrodynamics; Computerized Simulation; Three Dimensional Models

20010088816 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Living With a Star Program Space Environment Testbed

Barth, Janet, NASA Goddard Space Flight Center, USA; [2001]; 14p; In English; Space Environment and Effects Workshop, 26-28 Jun. 2001, Huntsville, AL, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation describes the objective, approach, and scope of the Living With a Star (LWS) program at the Marshall Space Flight Center. Scientists involved in the project seek to refine the understanding of space weather and the role of solar variability in terrestrial climate change. Research and the development of improved analytic methods have led to increased predictive capabilities and the improvement of environment specification models. Specifically, the Space Environment Testbed (SET) project of LWS is responsible for the implementation of improved engineering approaches to observing solar effects on climate change. This responsibility includes technology development, ground test protocol development, and the development of a technology application model/engineering tool.

CASI

Aerospace Environments; Solar Activity Effects; Space Weather; Technology Utilization; Space Observations (From Earth)

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see 52 Aerospace Medicine. For theory see 73 Nuclear Physics.

20010084218 NASA Marshall Space Flight Center, Huntsville, AL USA

Discovery of Weak EXO 2030+375 Outbursts With BATSE

Wilson, Colleen A., NASA Marshall Space Flight Center, USA; Finger, Mark H., NASA Marshall Space Flight Center, USA; Coe, M. J., Southampton Univ., UK; Laycock, Silas, Southampton Univ., UK; [2001]; 1p; In English; Gamma 2001, 4-6 Apr. 2001, Baltimore, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

EXO 2030+375 is a 42-second X-ray pulsar orbiting a Be star every 46 days. Previous work using epoch-folded frequency searches over 1-day intervals of BATSE data [1] indicated that EXO 2030+375 underwent a 2.5 year period of quiescence from 1993 September-1996 March. Improvements in the search method that reduced systematic errors due to (1) aperiodic noise from the nearby black hole candidate Cyg X-1 and (2) sources undergoing Earth occultation, have allowed longer time intervals to be searched, hence increasing BATSE's sensitivity. Using the improved method with 4-day intervals, we detect EXO 2030+375 near most of its periastron passages during 1993 September-1996 March and for most periastron passages during BATSE's 9 years in orbit. Earth occultation measurements in the 20-100 keV band, selected when Cyg X-1 was below the Earth's horizon and epoch-folded at EXO 2030+375's orbital period of 46 days, also indicate that EXO 2030+375 was active for most of the mission. We will present histories of EXO 2030+375's pulse frequency and pulsed flux. In addition, we will present results of a pulse timing analysis and evidence that EXO 2030+375's outbursts shift in orbital phase.

Author

Gamma Ray Bursts; Orbital Elements; X Rays; Black Holes (Astronomy); B Stars

20010084629 NASA Marshall Space Flight Center, Huntsville, AL USA

Multi-Wavelength Observations of the Soft Gamma Repeater SGR 1900+14 During its April 2001 Activation

Kouveliotou, C., NASA Marshall Space Flight Center, USA; Tennant, A. F., NASA Marshall Space Flight Center, USA; Woods, P., NASA Marshall Space Flight Center, USA; Hurley, K., NASA Marshall Space Flight Center, USA; Fender, R. P., NASA Marshall Space Flight Center, USA; Garrington, S. T., NASA Marshall Space Flight Center, USA; Patel, S. K., NASA Marshall Space Flight Center, USA; Gogus, E., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The soft-gamma repeater SGR became active on 18 April 2001 after about a year of quiescence; it had remained at a very low state of activity since the fall of 1998, when it exhibited extraordinary flaring. We have observed the source in the gamma and X-rays with *Ulysses* and *Chandra*, and in the radio with MERLIN. We report here the confirmation of a two component X-ray spectrum (power law + blackbody), indicating emission from the neutron star surface. We have determined that there is a dust halo surrounding the source that extends up to $\sim 100'$ from the SGR center, which is due to the scattering in the Interstellar Medium.

Author

Interstellar Matter; X Rays; Gamma Rays; Repeaters; Neutron Stars

20010086591 NASA Marshall Space Flight Center, Huntsville, AL USA

Atmospheric Nitrogen Fluorescence Yield

Adams, J. H., Jr., NASA Marshall Space Flight Center, USA; Christl, M. J., NASA Marshall Space Flight Center, USA; Fountain, W. F., NASA Marshall Space Flight Center, USA; Gregory, J. C., Alabama Univ., USA; Martens, K. U., Utah Univ., USA; Sokolsky, Pierre, Utah Univ., USA; [2001]; 1p; In English; International Cosmic Ray Conference, 7-15 Aug. 2001, Hamburg, Germany; No Copyright; Avail: Issuing Activity; Abstract Only

Several existing and planned experiments estimate the energies of ultra-high energy cosmic rays from air showers using the atmospheric nitrogen fluorescence. The nitrogen fluorescence yield from air shower electrons depends on the atmospheric composition. We will discuss the uncertainties in the fluorescence yield from electrons in the real atmosphere and describe a concept for a small balloon payload to measure the atmospheric fluorescence yield as a function of altitude.

Author

Nitrogen; Fluorescence; Atmospheric Composition; Yield

99
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20010085819 American Univ., Washington, DC USA

The Decision to Send Humans Back to the Moon and on to Mars: Space Exploration Initiative History Project

McCurdy, Howard E., American Univ., USA; March 1992; 274p; In English; See also 20010085820 through 20010085826
Report No.(s): NASA-HHR-56; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This folder contains working papers collected to date on a NASA-sponsored history project to document the events leading up to the July 20, 1989 speech setting forth the objectives of the Space Exploration Initiative. Included are a chronology of events, briefing papers produced by the NASA Working Group laying out proposal, briefing charts used to present the proposal, a copy of the President's speech, and an essay summarizing the events that led up to the announcement. Additionally, two of the interviews conducted as part of the project are enclosed.

Derived from text

Lunar Exploration; Mars Exploration; Histories

20010085820 American Univ., Washington, DC USA

Introduction: Back to The Moon and on to Mars

McCurdy, Howard E., American Univ., USA; The Decision to Send Humans Back to the Moon and on to Mars: Space Exploration Initiative History Project; March 1992, pp. 4-8; In English; See also 20010085819; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

On July 20, 1989, President George Bush proposed that the USA undertake as the long range objective of its civil space program an initiative that would lead to the establishment of a permanent base on the moon and a human expedition to Mars. His speech, delivered from the steps of the National Air and Space Museum in Washington, D.C., on the 20th anniversary of the first landing on the moon, gave official blessing to what had long been the unapproved purpose of the American civilian space.

Derived from text

Space Programs; Lunar Exploration; Mars Exploration

20010085821 American Univ., Washington, DC USA

Space Exploration Initiative: Chronology

McCurdy, Howard E., American Univ., USA; The Decision to Send Humans Back to the Moon and on to Mars: Space Exploration Initiative History Project; March 1992, pp. 9-21; In English; See also 20010085819; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This chronology gives an overview of the human space exploration initiative from 1956 through 1989. Details are given for the political milestones of the initiative, including information on presidential mandates and NASA Administrator appointments.

CASI
Chronology; Space Exploration

20010085822 American Univ., Washington, DC USA

Transcript of Interview: Franklin D. Martin

McCurdy, Howard E., American Univ., USA; The Decision to Send Humans Back to the Moon and on to Mars: Space Exploration Initiative History Project; March 1992, pp. 22-100; In English; See also 20010085819; No Copyright; Avail: CASI; A05, Hardcopy; A03, Microfiche

This document is a transcript of an interview given by Howard E. McCurdy to Franklin D. Martin. Martin gives details on his background including information on his family, education, and career path, his thoughts on the human space exploration initiative and the mission to the Moon, his presentation to the Vice President about Civil Space Exploration: The Lunar Base, and President Kennedy's pronouncement of America's intent to go to the Moon and the effects of the speech.

CASI

Histories; Lunar Exploration

20010085823 American Univ., Washington, DC USA

Transcript of Interview: Mark K. Craig

McCurdy, Howard E., American Univ., USA; The Decision to Send Humans Back to the Moon and on to Mars: Space Exploration Initiative History Project; March 1992, pp. 101-146; In English; See also 20010085819; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This document is a transcript of an interview given by Howard E. McCurdy to Mark K. Craig. Craig gives details on his background including information on his family, education, and career path, his reaction to the news that America was planning to put a man on the Moon, why he thinks we should go to Mars, and the political speeches made at the time of early human space exploration planning.

CASI

Lunar Exploration; Histories

20010085824 NASA, Washington, DC USA

A Scenario for Human Exploration of the Moon and Mars

Craig, Mark, NASA, USA; The Decision to Send Humans Back to the Moon and on to Mars: Space Exploration Initiative History Project; March 1992, pp. 147-196; In English; See also 20010085819; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Following a meeting on May 31, 1989, NASA received a request from Vice President Dan Quayle to conduct a study in preparation for a presidential decision on July 20, 1989, that would establish a NASA exploration goal. NASA Administrator Richard Truly set up a Working Group under Frank Martin and Mark Craig, which met at the Johnson Space Center and put together the data necessary to brief the White House on a appropriate plan. The group met from June 4 through June 11 to study the issue and prepare briefing charts. Many of the charts that the group prepared follow. The charts were used to brief Admiral Truly and other high-ranking NASA officials on June 13, 1989.

Author

Lunar Exploration; Mars Exploration; Manned Space Flight

20010085825 NASA, Washington, DC USA

Civil Space Exploration Initiative

The Decision to Send Humans Back to the Moon and on to Mars: Space Exploration Initiative History Project; March 1992, pp. 197-237; In English; See also 20010085819; No Copyright; Avail: CASI; A05, Hardcopy; A03, Microfiche

On or about June 15, 1989, Admiral Truly and Frank Martin presented NASA's conceptual plan for an exploration program to Vice-President Dan Quayle. Presentations by Truly and Quayle to a variety of groups outside the administration ensued. These officials drew upon the following charts for their presentations. The charts, based on the technical material supplied by the NASA Working Group, were updated and rearranged as the presentations transpired.

Author

Lunar Exploration; Manned Space Flight; Mars Exploration; Robotics

20010085826 NASA, Washington, DC USA

NASA Advisory Council: Fact-Finding Session

Cohen, Aaron, NASA, USA; Martin, Franklin D., NASA, USA; Craig, Mark K., NASA, USA; Duke, Michael B., NASA, USA; The Decision to Send Humans Back to the Moon and on to Mars: Space Exploration Initiative History Project; March 1992, pp. 1-7; In English, 25-26 Oct. 1989, Washington, DC, USA; See also 20010085819; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The principal agenda item for this fact-finding meeting of the NASA Advisory Council was NASA's preliminary planning of options to implement the President's initiative for establishing a base on the Moon and launching a human expedition to Mars. NASA's presentation (1) reviewed the key elements in the President's speech of July 20, 1989, summoning the Nation to launch a new exploration initiative to the Moon and Mars; (2) outlined five candidate options analyzed in terms of schedule and scale of effort (for a return to the Moon and for a voyage to Mars); (3) outlined tentative robotic mission milestones for both a 'vigorous deployment' option and a 'paced deployment' option; (4) reviewed Earth-to-orbit delivery requirements for a lunar heavy-lift launch vehicle, the National Space Transportation System, and a Mars heavy-lift launch vehicle; (5) summarized the associated Space Station Freedom requirements; (6) outlined the technology as well as human factors requirements for the candidate options;

and (7) summarized the themes and approaches that could be employed for the science aspects of a national Moon/Mars exploration program.

Derived from text

Heavy Lift Launch Vehicles; Mars Exploration; Lunar Exploration; Manned Space Flight

Subject Term Index

A

- A STARS, 237
- ABLATION, 39
- ABNORMALITIES, 156
- ABSORPTION SPECTRA, 113, 231, 239
- ABSORPTION SPECTROSCOPY, 107, 109
- ACCELERATED LIFE TESTS, 65
- ACCELERATION (PHYSICS), 36, 154
- ACCELERATORS, 201
- ACCIDENT INVESTIGATION, 5
- ACCIDENT PREVENTION, 9
- ACCIDENTS, 225
- ACCRETION DISKS, 235
- ACOUSTIC ATTENUATION, 60
- ACOUSTIC MEASUREMENT, 192
- ACOUSTICS, 8, 192, 193
- ACTIVE CONTROL, 72
- ACTUATORS, 10, 28
- ADA (PROGRAMMING LANGUAGE), 179
- ADAPTERS, 30
- ADDITIVES, 211
- ADENOVIRUSES, 137
- ADIABATIC CONDITIONS, 48
- ADIABATIC EQUATIONS, 190
- ADRENAL GLAND, 148
- ADVANCED COMPOSITION EXPLORER, 104
- ADVECTION, 73, 108, 121
- AERODYNAMIC CONFIGURATIONS, 7
- AERODYNAMIC FORCES, 10
- AERODYNAMIC HEATING, 1
- AERODYNAMIC NOISE, 12
- AERODYNAMICS, 75, 220
- AEROELASTICITY, 3
- AEROGELS, 44, 49
- AEROMANEUVERING, 19
- AEROSOLS, 46, 74, 100, 102, 103, 107, 117, 118, 132
- AEROSPACE ENGINEERING, 8, 219, 220
- AEROSPACE ENVIRONMENTS, 29, 115, 186, 230, 245, 249
- AEROSPACE INDUSTRY, 1
- AEROSPACE MEDICINE, 5, 23, 51, 142, 143, 144, 146, 147, 149, 150, 152, 155
- AEROSPACE PLANES, 27
- AEROSPACE SAFETY, 150
- AEROSPACE SCIENCES, 220, 229
- AEROSPACE SYSTEMS, 25, 26, 58, 166
- AEROSPACE VEHICLES, 9, 14, 162
- AEROTHERMODYNAMICS, 52
- AIR FLOW, 56
- AIR POLLUTION, 104, 134
- AIR PURIFICATION, 160
- AIR QUALITY, 134, 162
- AIR TRAFFIC CONTROL, 3, 4, 5, 164
- AIR TRANSPORTATION, 4
- AIR WATER INTERACTIONS, 106, 112
- AIRBORNE EQUIPMENT, 184
- AIRBORNE/SPACEBORNE COMPUTERS, 166
- AIRCRAFT ACCIDENTS, 4, 5, 9
- AIRCRAFT APPROACH SPACING, 5
- AIRCRAFT CONSTRUCTION MATERIALS, 10
- AIRCRAFT DESIGN, 2, 7
- AIRCRAFT ENGINES, 10
- AIRCRAFT LANDING, 2, 168
- AIRCRAFT MAINTENANCE, 7, 12
- AIRCRAFT NOISE, 102
- AIRCRAFT PILOTS, 4, 139, 142, 146, 147, 152
- AIRCRAFT RELIABILITY, 6
- AIRCRAFT SAFETY, 4, 9
- AIRCRAFT STRUCTURES, 40, 43
- AIRFOILS, 2
- AIRFRAME MATERIALS, 8
- AIRFRAMES, 48
- AIRPORTS, 2
- ALGAE, 140
- ALGORITHMS, 12, 17, 19, 20, 31, 32, 34, 35, 71, 76, 77, 117, 174, 178, 181, 185, 188, 221, 223, 225, 227
- ALIGNMENT, 28
- ALPHA PARTICLES, 207
- ALTIMETERS, 19
- ALTITUDE, 123
- ALUMINUM, 40, 191
- ALUMINUM ALLOYS, 8, 48, 81, 191
- ALUMINUM ARSENIDES, 68
- AMBIENT TEMPERATURE, 203
- AMINES, 47
- AMINO ACIDS, 140
- AMMONIA, 43
- AMMUNITION, 49
- AMORPHOUS MATERIALS, 211
- AMPHETAMINES, 145
- ANAEROBES, 99
- ANALOG TO DIGITAL CONVERTERS, 66
- ANALOGIES, 150
- ANALYTIC FUNCTIONS, 187
- ANALYTIC GEOMETRY, 57, 188
- ANALYTICAL CHEMISTRY, 98
- ANGULAR DISTRIBUTION, 201
- ANGULAR MOMENTUM, 77
- ANGULAR VELOCITY, 34
- ANODES, 95
- ANODIC STRIPPING, 52
- ANOXIA, 130
- ANTARCTIC REGIONS, 109
- ANTENNA COMPONENTS, 67
- ANTENNA DESIGN, 59
- ANTENNA RADIATION PATTERNS, 61, 62
- ANTIFERROMAGNETISM, 212
- ANTIGENS, 129
- ANTIGRAVITY, 152
- ANTIHISTAMINICS, 143
- ANTIHYPERTENSIVE AGENTS, 142
- ANTIPROTONS, 199
- APERTURES, 81, 180
- APOPTOSIS, 137, 140
- APPLICATIONS OF MATHEMATICS, 185
- APPLICATIONS PROGRAMS (COMPUTERS), 170, 177, 186, 246
- APPROACH CONTROL, 55
- APPROXIMATION, 214
- AQUEOUS SOLUTIONS, 46
- ARCHITECTURE (COMPUTERS), 3, 166, 167, 172, 174
- ARCTIC REGIONS, 98, 101, 106, 120, 123
- ARMED FORCES, 164
- ARMED FORCES (FOREIGN), 159
- ARMED FORCES (UNITED STATES), 186, 190
- ARRAYS, 68, 195, 204
- ARSENIC COMPOUNDS, 47
- ARTIFICIAL GRAVITY, 162
- ARTIFICIAL INTELLIGENCE, 174, 179
- ARTIFICIAL SATELLITES, 14, 15, 24, 25, 29
- ASIA, 104
- ASSAYING, 129
- ASSESSMENTS, 178
- ASSIMILATION, 57
- ASTEROSEISMOLOGY, 203
- ASTHMA, 143

ASTRODYNAMICS, 16
 ASTROMETRY, 78
 ASTRONOMICAL INTERFEROMETRY, 78
 ASTRONOMICAL MODELS, 246
 ASTRONOMICAL OBSERVATORIES, 78
 ASTRONOMY, 13, 24, 216
 ASTROPHYSICS, 240, 241, 242
 ASYMPTOTIC METHODS, 183
 ATLAS LAUNCH VEHICLES, 26
 ATMOSPHERIC BOUNDARY LAYER, 98
 ATMOSPHERIC CHEMISTRY, 102, 109, 111, 220, 246
 ATMOSPHERIC CIRCULATION, 108, 121, 124, 125
 ATMOSPHERIC COMPOSITION, 100, 104, 107, 109, 111, 113, 115, 247, 250
 ATMOSPHERIC CONDUCTIVITY, 108, 244
 ATMOSPHERIC DENSITY, 112, 117
 ATMOSPHERIC EFFECTS, 117, 125
 ATMOSPHERIC ENTRY, 19
 ATMOSPHERIC GENERAL CIRCULATION MODELS, 124, 244
 ATMOSPHERIC HEATING, 126
 ATMOSPHERIC MODELS, 91, 101, 106, 107, 108, 116, 117, 122, 125, 236, 247
 ATMOSPHERIC MOISTURE, 125, 220
 ATMOSPHERIC PRESSURE, 105
 ATMOSPHERIC RADIATION, 126
 ATMOSPHERIC SCATTERING, 125
 ATMOSPHERIC SOUNDING, 105, 113, 118, 125
 ATMOSPHERIC STRATIFICATION, 108
 ATMOSPHERIC TEMPERATURE, 89, 120, 236
 ATMOSPHERIC TURBULENCE, 114
 ATOMIC ENERGY LEVELS, 45
 ATOMIC PHYSICS, 207
 ATOMIC SPECTRA, 98
 ATTACK AIRCRAFT, 102
 ATTITUDE (INCLINATION), 15, 17, 154, 165
 ATTITUDE CONTROL, 10, 22, 34, 76
 ATTITUDE GYROS, 76
 AUDIO DATA, 59
 AUDITORY SIGNALS, 154
 AUGMENTATION, 12
 AURORAS, 110
 AUTOCORRELATION, 119
 AUTOMORPHISMS, 189
 AUTONOMOUS NAVIGATION, 6, 17, 18, 179, 231

AUTONOMY, 19, 34
 AUTOREGRESSIVE MOVING AVERAGE, 59
 AVIATION METEOROLOGY, 116
 AVIONICS, 15

B

B STARS, 250
 B-1 AIRCRAFT, 12
 BACKGROUND RADIATION, 236
 BACKSCATTERING, 33, 103, 181, 217
 BALTIC SEA, 69, 128
 BAND STRUCTURE OF SOLIDS, 214
 BARIUM OXIDES, 209
 BAROMETERS, 195
 BAYES THEOREM, 131, 185
 BEAM NEUTRALIZATION, 207
 BEAM STEERING, 80
 BEAMFORMING, 80, 201
 BED REST, 153
 BENDING, 199
 BERYLLIUM, 203
 BESSEL FUNCTIONS, 183
 BIAS, 32, 76
 BIBLIOGRAPHIES, 201
 BIG BANG COSMOLOGY, 238
 BIHARMONIC EQUATIONS, 188
 BINARY STARS, 230
 BINDING ENERGY, 197, 212
 BIOCHEMISTRY, 135
 BIOELECTRICITY, 168
 BIOFEEDBACK, 152
 BIOGEOCHEMISTRY, 99, 118, 130
 BIOINSTRUMENTATION, 213
 BIOLOGICAL EVOLUTION, 43, 243
 BIOMASS, 165
 BIOREACTORS, 165
 BIOSPHERE, 113, 129
 BIPOLAR TRANSISTORS, 226
 BISMUTH, 54
 BLACK HOLES (ASTRONOMY), 231, 238, 250
 BLADE SLAP NOISE, 192
 BLOCK COPOLYMERS, 50
 BLOOD, 5
 BLOOD FLOW, 153
 BODY WEIGHT, 156
 BOEING 757 AIRCRAFT, 168
 BONDED JOINTS, 84
 BONDING, 212
 BONE DEMINERALIZATION, 135
 BONE MINERAL CONTENT, 135
 BOREL SETS, 189
 BORON NITRIDES, 210
 BOUNDARY CONDITIONS, 83, 183

BOUNDARY LAYER CONTROL, 71
 BOUNDARY LAYER FLOW, 70
 BOUNDARY LAYER TRANSITION, 12
 BOUNDARY LAYERS, 104
 BOUNDARY VALUE PROBLEMS, 181, 186
 BRAIN, 154, 155
 BRAIN CIRCULATION, 153
 BREADBOARD MODELS, 165
 BROADBAND, 68
 BROWN DWARF STARS, 246
 BURNING RATE, 42
 BYPASSES, 208

C

C (PROGRAMMING LANGUAGE), 175
 C-135 AIRCRAFT, 12
 CALCIUM, 135
 CALCULUS OF VARIATIONS, 189
 CALIBRATING, 60, 61, 75, 76, 105, 233
 CALMODULIN, 135
 CANCER, 129, 131, 133, 136, 137, 138, 139, 141, 194
 CANOPIES (VEGETATION), 91
 CAPACITANCE, 67
 CAPILLARY FLOW, 55
 CARBON, 50, 89, 195, 209, 213, 214
 CARBON 13, 237
 CARBON DIOXIDE, 47, 89
 CARBON DIOXIDE CONCENTRATION, 104, 162
 CARBON FIBERS, 203
 CARBON MONOXIDE, 102, 239
 CARBONATES, 84, 86, 109, 241, 246
 CARBONYL COMPOUNDS, 38
 CARCINOGENS, 129
 CARDIOLOGY, 151
 CARDIOVASCULAR SYSTEM, 23
 CASING, 64
 CASSINI MISSION, 67
 CAST ALLOYS, 47
 CATALYSIS, 97
 CATALYSTS, 27, 97
 CATECHOLAMINE, 148
 CATHODES, 68
 CATIONS, 245
 CCD CAMERAS, 75
 CELESTIAL BODIES, 238
 CELESTIAL MECHANICS, 229
 CELESTIAL NAVIGATION, 231
 CELL DIVISION, 194
 CELLS (BIOLOGY), 130, 135, 137
 CENTRAL NERVOUS SYSTEM STIMULANTS, 145
 CENTRAL PROCESSING UNITS, 174

CENTRIFUGING, 135
 CERAMICS, 51, 52, 53, 64, 88
 CEREBRUM, 153
 CHANNEL CAPACITY, 205
 CHAOS, 73
 CHARACTERIZATION, 52, 178, 197
 CHARGE COUPLED DEVICES, 75, 192
 CHARGE EFFICIENCY, 92, 93, 95
 CHARGED PARTICLES, 190, 198
 CHECKOUT, 21
 CHEMICAL ANALYSIS, 85, 98
 CHEMICAL BONDS, 212
 CHEMICAL COMPOSITION, 89, 102, 115
 CHEMICAL PROPULSION, 27
 CHEMICAL REACTIONS, 38, 43, 51, 186
 CHEMOTHERAPY, 131, 137, 138
 CHRONIC CONDITIONS, 137
 CHRONOLOGY, 89, 251
 CIRCADIAN RHYTHMS, 134
 CIRCUIT PROTECTION, 92
 CIRCUITS, 68
 CIRCULATION, 12
 CITIES, 228
 CLADDING, 39, 41
 CLIMATE, 101, 125, 247
 CLIMATE CHANGE, 98, 103, 106, 118, 124, 128
 CLIMATE MODELS, 98, 106, 119
 CLIMATOLOGY, 100, 102, 103, 106, 118, 126, 128, 243
 CLINICAL MEDICINE, 138, 139, 141, 147
 CLOUD PHYSICS, 100, 107, 117, 123, 124
 CLOUD-TO-GROUND DISCHARGES, 127
 CLOUDS (METEOROLOGY), 78, 113, 114, 117, 121, 126
 CLUSTER ANALYSIS, 126
 CLUSTERS, 44, 50
 COALESCING, 123
 COATING, 39
 COATINGS, 213
 COGNITION, 159
 COLD PLASMAS, 207
 COLLINEARITY, 201
 COLLISIONLESS PLASMAS, 239
 COLLISIONS, 16
 COLOR, 234
 COLOR CENTERS, 79
 COMBINED CYCLE POWER GENERATION, 36
 COMBUSTION CHAMBERS, 9
 COMBUSTION CHEMISTRY, 245
 COMBUSTION PHYSICS, 206
 COMETS, 240
 COMMAND AND CONTROL, 63, 159, 172, 175, 186
 COMMERCIAL AIRCRAFT, 119
 COMMERCIALIZATION, 30
 COMMUNICATION, 172, 175
 COMMUNICATION EQUIPMENT, 59
 COMMUNICATION NETWORKS, 68, 169, 171
 COMPARISON, 120
 COMPETITION, 195
 COMPLEX SYSTEMS, 8, 90, 166
 COMPLEX VARIABLES, 182, 183, 188, 189
 COMPONENT RELIABILITY, 82
 COMPOSITE MATERIALS, 7, 38, 41, 43
 COMPOSITE STRUCTURES, 7, 40, 41, 203
 COMPRESSIBLE FLOW, 168
 COMPRESSORS, 11, 72
 COMPUTATION, 38, 181, 182, 224
 COMPUTATIONAL FLUID DYNAMICS, 1, 54, 71, 73, 82, 168, 176
 COMPUTATIONAL GRIDS, 8, 166, 192, 224
 COMPUTER AIDED DESIGN, 8, 169
 COMPUTER ANIMATION, 171
 COMPUTER ASSISTED INSTRUCTION, 159
 COMPUTER DESIGN, 173
 COMPUTER GRAPHICS, 177
 COMPUTER INFORMATION SECURITY, 175
 COMPUTER NETWORKS, 60, 171, 176, 177, 195, 218, 225, 226
 COMPUTER PROGRAMMING, 6
 COMPUTER PROGRAMS, 7, 40, 82, 162, 168, 170, 171, 173, 174, 175, 182, 193, 196, 205, 227
 COMPUTER SYSTEMS PROGRAMS, 216
 COMPUTER TECHNIQUES, 11, 159, 224, 233
 COMPUTERIZED SIMULATION, 8, 10, 13, 18, 31, 32, 34, 35, 41, 50, 52, 57, 65, 69, 71, 73, 75, 76, 82, 83, 84, 116, 125, 127, 160, 171, 172, 184, 205, 209, 233, 234, 235, 249
 COMPUTERS, 172, 174, 193
 CONDENSERS (LIQUEFIERS), 72
 CONDUCTION BANDS, 214
 CONDUCTIVE HEAT TRANSFER, 70
 CONDUCTORS, 213
 CONFERENCES, 23, 91, 149, 182, 207, 215, 218, 222, 227, 229
 CONFORMAL MAPPING, 187, 188
 CONGRESSIONAL REPORTS, 134
 CONING MOTION, 22, 171
 CONSERVATION EQUATIONS, 42, 168
 CONSTITUTIVE EQUATIONS, 182
 CONSTRICTIONS, 4
 CONSTRUCTION, 97
 CONTAMINATION, 29, 104, 242
 CONTOURS, 187
 CONTROL, 162, 179
 CONTROL EQUIPMENT, 8, 71
 CONTROL MOMENT GYROSCOPES, 10
 CONTROL SIMULATION, 13
 CONTROL SYSTEMS DESIGN, 7, 34
 CONTROL THEORY, 31
 CONTROLLED FUSION, 207
 CONTROLLERS, 7, 34, 35, 61, 164, 180
 CONVECTION, 119
 CONVERGENCE, 60, 178
 COOLANTS, 200
 COOLING, 200
 COOLING SYSTEMS, 37
 COORDINATE TRANSFORMATIONS, 188
 COORDINATES, 188
 COPOLYMERS, 213
 CORES, 89
 CORONAL MASS EJECTION, 249
 CORONAS, 249
 CORRECTION, 214
 CORRELATION COEFFICIENTS, 196
 CORROSION PREVENTION, 46
 CORTICOSTEROIDS, 148
 COSMIC BACKGROUND EXPLORER SATELLITE, 238
 COSMIC RAYS, 236
 COSMOLOGY, 13, 219, 241
 COST EFFECTIVENESS, 86, 244
 COST ESTIMATES, 3
 COST REDUCTION, 18, 25
 COSTS, 129, 223
 COUNTDOWN, 27
 COUNTERMEASURES, 162
 COUNTERS, 169
 COUPLING, 212, 214
 CRACK PROPAGATION, 8, 48
 CRACKS, 82
 CRASHES, 225
 CROSS FLOW, 45
 CROSS SECTIONS, 214
 CROSSEOVERS, 19
 CRYOGENIC TEMPERATURE, 203
 CRYOGENICS, 203
 CRYSTAL GROWTH, 54, 55, 140, 212
 CRYSTAL STRUCTURE, 197

CRYSTALLIZATION, 55, 197
 CRYSTALS, 107
 CUMULATIVE DAMAGE, 8
 CURVATURE, 71
 CYCLES, 86
 CYCLONES, 111
 CYCLOTRON RESONANCE
 DEVICES, 64

D

DAMAGE, 10, 41
 DAMPING, 21
 DARK CURRENT, 90
 DATA, 197
 DATA ACQUISITION, 55, 69, 87, 119
 DATA BASE MANAGEMENT SYS-
 TEMS, 225, 227
 DATA BASES, 61, 62, 146, 150, 225
 DATA CORRELATION, 115
 DATA FLOW ANALYSIS, 59
 DATA MANAGEMENT, 170, 227
 DATA PROCESSING, 122
 DATA PROCESSING EQUIPMENT, 69
 DATA REDUCTION, 120, 201, 247
 DATA RETRIEVAL, 223
 DATA STRUCTURES, 61, 62
 DATA SYSTEMS, 85, 87, 122, 225, 247
 DEBONDING (MATERIALS), 39
 DEBRIS, 49
 DECISION MAKING, 58, 159
 DECISION SUPPORT SYSTEMS, 131
 DECOMPOSITION, 27, 246
 DEFECTS, 49, 82, 209
 DEFENSE PROGRAM, 115
 DEFLAGRATION, 42
 DEFLECTION, 203
 DEFORMATION, 3, 182
 DEGENERATION, 180
 DEGREES OF FREEDOM, 22, 108
 DEICING, 46
 DELAMINATING, 40
 DELTA 3 LAUNCH VEHICLE, 26
 DELTA 4 LAUNCH VEHICLE, 26
 DEMODULATION, 134
 DENITROGENATION, 111
 DENSITY (NUMBER/VOLUME), 212
 DEOXYRIBONUCLEIC ACID, 133
 DEPLOYMENT, 37
 DERIVATION, 197
 DESERTS, 104
 DESIGN ANALYSIS, 2, 7, 26, 54, 57, 58,
 71, 96, 97, 162, 172, 204, 208, 230,
 235, 244
 DESTRUCTIVE TESTS, 66, 96

DESYNCHRONIZATION (BIOLOGY),
 145
 DETECTION, 68, 138, 167, 180
 DETECTORS, 198
 DEUTERIUM, 237, 239
 DEUTERONS, 198
 DIAMAGNETISM, 206
 DICTIONARIES, 224
 DIELECTRIC WAVEGUIDES, 201
 DIELECTRICS, 68
 DIETS, 156, 164
 DIFFERENTIAL ABSORPTION
 LIDAR, 109
 DIFFERENTIAL EQUATIONS, 183, 186
 DIFFERENTIAL GEOMETRY, 188
 DIFFRACTION, 55, 204
 DIFFUSE INTERSTELLAR BANDS,
 231, 242
 DIFFUSION, 42, 187
 DIFFUSION COEFFICIENT, 45
 DIFFUSION FLAMES, 185
 DIGITAL DATA, 178
 DIGITAL TELEVISION, 190
 DIRECTIONAL SOLIDIFICATION
 (CRYSTALS), 54, 56
 DIRECTORIES, 227
 DISCONTINUITY, 190
 DISCRETE COSINE TRANSFORM,
 169, 170
 DISCRETE FUNCTIONS, 168, 188
 DISCRETIZATION (MATHEMATICS),
 168, 187
 DISKS (SHAPES), 188
 DISORIENTATION, 11
 DISPERSING, 235
 DISPLAY DEVICES, 160
 DISSECTION, 136, 140
 DISTRIBUTED INTERACTIVE SIM-
 ULATION, 174
 DISTRIBUTED MEMORY, 176
 DISTRIBUTED PARAMETER SYS-
 TEMS, 167
 DISTRIBUTED PROCESSING, 169,
 172, 225, 226
 DIVERTORS (FUSION REACTORS),
 207
 DMSP SATELLITES, 112
 DOCUMENT MARKUP LANGUAGES,
 177
 DOPAMINE, 140
 DOPED CRYSTALS, 49, 202, 211, 226
 DROPS (LIQUIDS), 117
 DROUGHT, 101
 DRUGS, 131, 140, 142, 143, 144, 145,
 146, 147, 148, 157
 DRYING, 161
 DUCTILITY, 47

DUCTS, 56
 DYNAMIC MODELS, 71, 118, 160, 180
 DYNAMIC RANGE, 60
 DYNAMIC RESPONSE, 152, 184, 194
 DYNAMIC STABILITY, 243
 DYNAMIC STRUCTURAL ANALYSIS,
 8, 194
 DYNAMO THEORY, 248

E

EAR, 152
 EARTH (PLANET), 186
 EARTH ATMOSPHERE, 18
 EARTH IONOSPHERE, 127
 EARTH MAGNETOSPHERE, 201
 EARTH OBSERVATIONS (FROM
 SPACE), 74
 EARTH OBSERVING SYSTEM (EOS),
 88
 EARTH ORBITS, 17
 EARTH ROTATION, 105
 EARTH SCIENCES, 88, 119, 216, 218,
 220, 221
 EARTH SURFACE, 91, 129, 130
 EARTH TERMINALS, 60
 EARTH-MOON SYSTEM, 16, 17
 EARTHQUAKES, 107
 ECHO SOUNDING, 194
 ECLIPSES, 245
 ECOLOGY, 102
 ECONOMIC DEVELOPMENT, 103, 228
 ECONOMIC FACTORS, 228
 ECONOMIC IMPACT, 228
 ECOSYSTEMS, 87, 99, 118
 EDEMA, 157
 EDUCATION, 9, 11, 24, 30, 101, 109,
 135, 149, 150, 151, 176, 177, 184,
 190, 195, 215, 216, 217, 218, 219,
 220, 221, 222, 229, 233
 EFFICIENCY, 57
 EIGENVALUES, 42, 187
 EIKONAL EQUATION, 187, 214
 EJECTION, 30
 ELASTIC DEFORMATION, 41
 ELASTIC PROPERTIES, 83
 ELASTIC WAVES, 196
 ELECTRIC ARCS, 73
 ELECTRIC BATTERIES, 91, 93, 96
 ELECTRIC CHARGE, 65, 207
 ELECTRIC CURRENT, 214
 ELECTRIC FIELDS, 44, 45, 110, 190
 ELECTRIC POTENTIAL, 65, 94
 ELECTRIC SWITCHES, 92
 ELECTRICAL PROPERTIES, 88, 211
 ELECTRICAL RESISTIVITY, 49, 244
 ELECTRO-OPTICS, 3

- ELECTROCARDIOGRAPHY, 155
 ELECTROCHEMICAL CELLS, 94
 ELECTROCHEMISTRY, 45
 ELECTRODES, 128
 ELECTROENCEPHALOGRAPHY, 155
 ELECTROHYDRODYNAMICS, 70
 ELECTROLYTES, 65
 ELECTROLYTIC CELLS, 66, 94, 95, 96
 ELECTROMAGNETIC FIELDS, 198
 ELECTROMAGNETIC RADIATION, 69, 184
 ELECTROMAGNETISM, 128
 ELECTROMYOGRAPHY, 168
 ELECTRON ACCELERATORS, 198
 ELECTRON BUNCHING, 201
 ELECTRON DENSITY (CONCENTRATION), 110
 ELECTRON ENERGY, 115
 ELECTRON IRRADIATION, 195, 242
 ELECTRON ORBITALS, 214
 ELECTRON SPECTROSCOPY, 198, 242
 ELECTRON TRANSFER, 209, 214
 ELECTRON TRANSITIONS, 214
 ELECTRON TUNNELING, 47
 ELECTRONIC COMMERCE, 177
 ELECTRONIC EQUIPMENT, 97
 ELECTRONIC MAIL, 224
 ELECTRONIC STRUCTURE, 213
 ELECTRONIC WARFARE, 62
 ELECTRONS, 42, 208
 ELECTROPHORESIS, 45
 ELECTROSTATIC PROBES, 110
 ELECTROSTATICS, 45, 205
 ELECTROWEAK INTERACTIONS (FIELD THEORY), 196
 ELEMENTARY PARTICLES, 201
 ELLIPTIC DIFFERENTIAL EQUATIONS, 189
 ELLIPTIC FUNCTIONS, 183
 ELLIPTICITY, 57
 EMERGENCIES, 136
 EMISSION SPECTRA, 113, 233
 EMISSIVITY, 96
 EMITTANCE, 96
 EMITTERS, 68
 EMOTIONAL FACTORS, 157
 ENDOCRINE GLANDS, 144
 ENDOCRINE SYSTEMS, 144
 ENDURANCE, 46
 ENERGETIC PARTICLES, 40, 201, 231
 ENERGY CONSERVATION, 97
 ENERGY LEVELS, 110, 156
 ENERGY POLICY, 106
 ENERGY REQUIREMENTS, 130
 ENERGY SPECTRA, 71, 110
 ENERGY STORAGE, 10
 ENGINE DESIGN, 35
 ENGINE PARTS, 36
 ENVIRONMENT MANAGEMENT, 46
 ENVIRONMENT MODELS, 115, 186
 ENVIRONMENT PROTECTION, 97
 ENVIRONMENT SIMULATION, 174, 231
 ENVIRONMENT SIMULATORS, 174
 ENZYME ACTIVITY, 140, 156
 ENZYMES, 139
 EOS DATA AND INFORMATION SYSTEM, 88
 EPIDEMIOLOGY, 137
 ERBIUM, 202
 EROSION, 50
 ERROR ANALYSIS, 31, 56, 124
 ERRORS, 82, 112, 167, 169
 ESTIMATES, 126
 ESTIMATING, 14
 ESTROGENS, 129
 ETHANE, 42
 ETHICS, 146
 ETHNIC FACTORS, 137
 ETHYL ALCOHOL, 53
 ETIOLOGY, 133
 EULER EQUATIONS OF MOTION, 168
 EUROPE, 124
 EVALUATION, 122, 178
 EVAPORATORS, 72
 EVENT HORIZON, 238
 EXERCISE PHYSIOLOGY, 149
 EXHAUST EMISSION, 54, 106
 EXHAUST GASES, 12, 37, 106
 EXOBIOLOGY, 166, 246
 EXOSPHERE, 248
 EXPLORER 1 SATELLITE, 13
 EXPLOSIONS, 77
 EXPLOSIVE FORMING, 39
 EXPLOSIVES, 54
 EXPONENTIAL FUNCTIONS, 179, 185
 EXPOSURE, 132, 140, 151, 221
 EXTERNAL TANKS, 80
 EXTINCTION, 100
 EXTRACTION, 52, 99
 EXTRASOLAR PLANETS, 232, 237, 246
 EXTRATERRESTRIAL LIFE, 243
 EXTRATERRESTRIAL RADIATION, 40
 EXTRAVEHICULAR ACTIVITY, 149
 EXTRAVEHICULAR MOBILITY UNITS, 94
 EXTREME ULTRAVIOLET RADIATION, 110
F
 F-111 AIRCRAFT, 8
 FABRICATION, 41, 53, 210
 FACTORIAL DESIGN, 82
 FAILURE, 7, 167
 FAILURE ANALYSIS, 82, 185
 FAILURE MODES, 191
 FALSE ALARMS, 194
 FAN BLADES, 57
 FAR INFRARED RADIATION, 113
 FARM CROPS, 165
 FAST FOURIER TRANSFORMATIONS, 71
 FATIGUE (MATERIALS), 40
 FATIGUE LIFE, 48, 53
 FAULT DETECTION, 90, 180
 FEASIBILITY ANALYSIS, 103
 FEEDBACK, 225
 FEEDBACK CONTROL, 35, 154, 179
 FERROELECTRICITY, 64
 FERROMAGNETIC FILMS, 210
 FIBER COMPOSITES, 39
 FIBER OPTICS, 78
 FIBER-MATRIX INTERFACES, 39
 FIBROBLASTS, 140
 FIELD EFFECT TRANSISTORS, 69
 FIELD STRENGTH, 190
 FIELD THEORY (PHYSICS), 154
 FINANCIAL MANAGEMENT, 219, 223
 FINITE DIFFERENCE THEORY, 112, 181
 FINITE ELEMENT METHOD, 166, 183, 184, 192
 FIRES, 101
 FLANGES, 81
 FLAPPING, 2
 FLARED BODIES, 12
 FLEXORS, 155
 FLIGHT CHARACTERISTICS, 20
 FLIGHT CONTROL, 7, 168
 FLIGHT CREWS, 142, 143, 144, 145, 147, 162, 181
 FLIGHT HAZARDS, 5
 FLIGHT MECHANICS, 15
 FLIGHT OPERATIONS, 4
 FLIGHT PATHS, 3
 FLIGHT PLANS, 6
 FLIGHT RULES, 6
 FLIGHT SAFETY, 3
 FLIGHT SIMULATORS, 11
 FLIGHT SURGEONS, 146
 FLIGHT TESTS, 7, 160
 FLIR DETECTORS, 77
 FLOATING, 81
 FLOW DISTRIBUTION, 82

FLOW MEASUREMENT, 56
 FLOW STABILITY, 45
 FLOW VISUALIZATION, 12, 75
 FLUID DYNAMICS, 45, 70, 72, 108, 239
 FLUID FLOW, 70
 FLUID MECHANICS, 75
 FLUORESCENCE, 197, 250
 FLUORIDES, 213
 FLUX (RATE), 206
 FOCAL PLANE DEVICES, 61, 74
 FOCUSING, 233
 FOILS (MATERIALS), 204
 FORECASTING, 6, 106, 122, 126, 248
 FOREST MANAGEMENT, 87, 103
 FORMALISM, 63
 FORMAT, 176
 FORTRAN, 172
 FORWARD SCATTERING, 205
 FOSSILS, 86, 89
 FOUR BODY PROBLEM, 16
 FOUR-WAVE MIXING, 180
 FOURIER SERIES, 183
 FOURIER TRANSFORMATION, 77
 FRACTURE MECHANICS, 48, 82
 FRACTURE STRENGTH, 48
 FRACTURES (MATERIALS), 39, 82
 FRAGMENTATION, 49, 200
 FRAGMENTS, 10, 49
 FREE CONVECTION, 114
 FREE ENERGY, 65
 FREE FLOW, 12
 FREQUENCIES, 66, 67, 202
 FREQUENCY RESPONSE, 198
 FRETting, 53
 FRICTION FACTOR, 206
 FRICTION MEASUREMENT, 130
 FRICTION WELDING, 80, 81, 179
 FUEL COMBUSTION, 81
 FUEL FLOW, 37
 FUEL SYSTEMS, 37
 FUELS, 106
 FULL SCALE TESTS, 10
 FULLERENES, 195
 FUNCTIONAL ANALYSIS, 183, 187
 FUNCTIONAL DESIGN SPECIFICATIONS, 57, 82
 FUNCTIONS, 170
 FURNACES, 56

G

GALACTIC COSMIC RAYS, 40, 244
 GALACTIC EVOLUTION, 238
 GALAXIES, 232, 237, 238

GALERKIN METHOD, 187
 GALILEO SPACECRAFT, 245
 GALLIUM ARSENIDES, 68
 GAMMA RAY BURSTS, 250
 GAMMA RAYS, 250
 GAS ANALYSIS, 161
 GAS DENSITY, 73
 GAS DYNAMICS, 208
 GAS GIANT PLANETS, 232, 235
 GAS MIXTURES, 53, 162, 206
 GAS TEMPERATURE, 37
 GASEOUS ROCKET PROPELLANTS, 37
 GASES, 129, 132
 GASTROINTESTINAL SYSTEM, 144
 GAUSS EQUATION, 166
 GELS, 44, 45
 GENE EXPRESSION, 139
 GENES, 131, 133, 136, 141
 GENETIC ALGORITHMS, 6, 180
 GENETICS, 140
 GEOCHEMISTRY, 84
 GEODESIC LINES, 188
 GEOLOGICAL FAULTS, 107, 116
 GEOLOGICAL SURVEYS, 85, 87
 GEOMAGNETISM, 104, 127
 GEOMORPHOLOGY, 243
 GEOPOTENTIAL HEIGHT, 108
 GET AWAY SPECIALS (STS), 27
 GLOBAL POSITIONING SYSTEM, 6, 17, 117
 GLOBULAR CLUSTERS, 230
 GLUONS, 197
 GOES SATELLITES, 31
 GRAFTING, 50
 GRAIN BOUNDARIES, 213
 GRAND UNIFIED THEORY, 199
 GRANTS, 222, 229
 GRAPHICAL USER INTERFACE, 173
 GRAPHITE, 39, 50, 195
 GRAPHITE-EPOXY COMPOSITES, 40
 GRAPHS (CHARTS), 75
 GRASSLANDS, 87
 GRAVITATION, 148, 238
 GRAVITATIONAL EFFECTS, 162
 GRAVITATIONAL FIELDS, 105, 247
 GRAVITY WAVES, 58, 111
 GREEN'S FUNCTIONS, 69
 GREENHOUSE EFFECT, 106
 GRID GENERATION (MATHEMATICS), 173, 192
 GRINDING MACHINES, 58
 GROUND STATE, 210
 GROUND WATER, 86
 GUIDANCE (MOTION), 15

GYROSCOPES, 22, 75, 76

H

H II REGIONS, 237
 HABITATS, 87
 HADRONS, 196, 201, 214
 HAIL, 127
 HALF CONES, 12
 HAMILTONIAN FUNCTIONS, 116
 HARMONIC FUNCTIONS, 182, 187, 188
 HARMONIC GENERATIONS, 202
 HARMONICS, 81
 HEAD (ANATOMY), 139, 152
 HEAD DOWN TILT, 154
 HEALTH, 137, 149, 150, 153, 164, 222, 223
 HEART FUNCTION, 23
 HEART RATE, 155
 HEAT PIPES, 70, 72
 HEAT PUMPS, 70
 HEAT TOLERANCE, 140
 HEAT TRANSFER, 37, 121
 HEATING, 249
 HEAVY IONS, 200
 HEAVY LIFT LAUNCH VEHICLES, 253
 HELICAL ANTENNAS, 67
 HELICOPTER PROPELLER DRIVE, 82
 HELICOPTERS, 3, 192
 HELIOSPHERE, 248
 HELIUM, 47
 HELMET MOUNTED DISPLAYS, 79, 161
 HEMOGLOBIN, 5
 HERTZSPRUNG-RUSSELL DIAGRAM, 243
 HETEROGENEITY, 86
 HETEROJUNCTIONS, 210
 HEURISTIC METHODS, 15, 182
 HIGH FLUX BEAM REACTORS, 200
 HIGH GRAVITY ENVIRONMENTS, 154
 HIGH POWER LASERS, 80
 HIGH RESOLUTION, 234
 HIGH STRENGTH ALLOYS, 48
 HIGH STRENGTH STEELS, 8
 HIGH TEMPERATURE, 206
 HIGH TEMPERATURE AIR, 208
 HIGH TEMPERATURE PROPELLANTS, 37
 HIGH TEMPERATURE SUPERCONDUCTORS, 213
 HIGH VACUUM, 55
 HISTORIES, 251, 252

HOMOGENEITY, 117
 HONEYCOMB STRUCTURES, 11
 HORIZON SCANNERS, 22
 HORIZONTAL FLIGHT, 192
 HORMONES, 144, 145, 148
 HUBBLE SPACE TELESCOPE, 22, 238
 HUMAN CENTRIFUGES, 11, 152
 HUMAN FACTORS ENGINEERING, 142, 159, 163, 165
 HUMAN PERFORMANCE, 63, 164
 HUMAN REACTIONS, 152
 HUMIDITY MEASUREMENT, 114
 HURRICANES, 123
 HYDROCARBONS, 236
 HYDROGEN, 9, 37, 46, 53, 99, 130, 210, 237
 HYDROGEN ATOMS, 37
 HYDROGEN COMPOUNDS, 104
 HYDROGEN FUELS, 37
 HYDROLOGY, 85, 87
 HYDROLOGY MODELS, 119, 121, 218
 HYDROPHONES, 78, 193
 HYDROSTATICS, 55
 HYDROXYL EMISSION, 58
 HYDROXYL RADICALS, 38, 58
 HYPERBOLIC COORDINATES, 183
 HYPERCUBE MULTIPROCESSORS, 77
 HYPERSOMNIA, 148
 HYPERSONIC HEAT TRANSFER, 12
 HYPERSONIC SPEED, 9
 HYPERSONIC WIND TUNNELS, 12
 HYPERTENSION, 142, 147
 HYPERTEXT, 177
 HYPERVELOCITY PROJECTILES, 49
 HYPOBARIC ATMOSPHERES, 156

I

ICE CLOUDS, 107, 111, 120
 ICE FORMATION, 46
 ICE PREVENTION, 46
 IGNITERS, 54
 IGNITION, 54
 IMAGE PROCESSING, 127, 178
 IMAGE RECONSTRUCTION, 180
 IMAGE RESOLUTION, 230
 IMAGE SATELLITE, 20
 IMAGERY, 237
 IMAGES, 77, 80
 IMAGING SPECTROMETERS, 74, 90
 IMAGING TECHNIQUES, 78, 90, 110, 125, 153, 191, 204, 217, 234
 IMPACT, 218
 IMPACT LOADS, 152
 IMPACT TESTS, 10, 40, 49

IMPACT VELOCITY, 48
 IMPLANTATION, 211
 INCENTIVES, 137
 INCOMPRESSIBLE FLOW, 23
 INCOMPRESSIBLE FLUIDS, 70
 INDUSTRIAL MANAGEMENT, 222
 INDUSTRIAL SAFETY, 12, 151
 INDUSTRIES, 179
 INEQUALITIES, 189
 INERTIA, 111
 INFORMATION DISSEMINATION, 224
 INFORMATION MANAGEMENT, 179, 224, 225
 INFORMATION PROCESSING (BIOLOGY), 159
 INFORMATION RETRIEVAL, 223, 227
 INFORMATION SYSTEMS, 175, 177, 178, 216, 218, 219, 222, 226
 INFORMATION TRANSFER, 224
 INFRARED DETECTORS, 74
 INFRARED IMAGERY, 74, 77
 INFRARED INTERFEROMETERS, 78
 INFRARED RADIATION, 77, 87
 INFRARED SPECTRA, 38, 98
 INFRARED SPECTROSCOPY, 43, 109, 113, 138, 231, 236, 240, 245
 INFRASONIC FREQUENCIES, 195
 INHIBITORS, 139, 194
 INJECTION, 71
 INJECTORS, 173, 191, 199
 INJURIES, 132, 139, 151, 152
 INORGANIC MATERIALS, 44
 INORGANIC PEROXIDES, 156
 INSERTS, 56
 INSTRUMENT COMPENSATION, 61
 INSURANCE (CONTRACTS), 137
 INTEGRATED CIRCUITS, 226
 INTEGRATED LIBRARY SYSTEMS, 227
 INTERFACES, 224
 INTERFEROMETERS, 77
 INTERNAL COMBUSTION ENGINES, 81, 206
 INTERNATIONAL RELATIONS, 228
 INTERNATIONAL SPACE STATION, 138
 INTERNETS, 60, 178, 233
 INTERPLANETARY DUST, 231, 240
 INTERPOLATION, 12
 INTERSTELLAR GAS, 231
 INTERSTELLAR MAGNETIC FIELDS, 248
 INTERSTELLAR MATTER, 43, 231, 232, 236, 237, 240, 241, 242, 248, 250
 INTERSTELLAR RADIATION, 236

INTERTROPICAL CONVERGENT ZONES, 128
 INVISCID FLOW, 168
 IO, 245, 246
 ION BEAMS, 200, 207
 ION EMISSION, 44
 ION PUMPS, 47
 ION SOURCES, 200
 IONIZATION, 44, 233, 237
 IONIZING RADIATION, 105, 181
 IONOSPHERES, 112
 IONOSPHERIC SOUNDING, 112
 IONOSPHERICS, 115
 IONS, 44, 49, 211
 IRON, 47, 212
 ISENTROPIC PROCESSES, 116
 ISOLATION, 90
 ISOMERS, 44
 ISOTOPES, 247
 ISOTOPIC LABELING, 237
 ITERATION, 189
 ITERATIVE SOLUTION, 28

J

JAPAN, 118
 JAPANESE SPACE PROGRAM, 15
 JAVA (PROGRAMMING LANGUAGE), 177, 227
 JET FLOW, 185
 JET LAG, 145
 JOINTS (JUNCTIONS), 210
 JUPITER ATMOSPHERE, 240

K

KALMAN FILTERS, 181
 KENTUCKY, 87
 KERNEL FUNCTIONS, 121, 183
 KINEMATICS, 17
 KINETIC EQUATIONS, 186, 208
 KINETICS, 83, 184
 KONDO EFFECT, 214

L

L-1011 AIRCRAFT, 26
 LABORATORIES, 171
 LAGRANGIAN FUNCTION, 108
 LAMINAR BOUNDARY LAYER, 2
 LAMINAR FLOW, 185
 LANDING LOADS, 152
 LANDSAT SATELLITES, 90, 178
 LANGUAGE PROGRAMMING, 225
 LAPLACE EQUATION, 188
 LARGE SPACE STRUCTURES, 41, 52
 LASER ABLATION, 39

LASER APPLICATIONS, 79, 109
 LASER ARRAYS, 78
 LASER BEAMS, 78, 80, 181
 LASERS, 79, 80, 109
 LAUNCH COSTS, 40
 LAUNCH VEHICLES, 15, 23, 24, 26, 29
 LAUNCHING, 15
 LAW (JURISPRUDENCE), 59
 LAYOUTS, 165
 LEAD (METAL), 52
 LEADERSHIP, 220
 LEAKAGE, 56
 LEARNING CURVES, 221
 LEARNING THEORY, 159
 LEPTONS, 197
 LEVITATION, 180
 LIAPUNOV FUNCTIONS, 31
 LIBRATION, 16
 LIFE (DURABILITY), 185
 LIFE SCIENCES, 138, 221
 LIFE SUPPORT SYSTEMS, 160, 165
 LIFTOFF (LAUNCHING), 185
 LIGANDS, 135
 LINE SPECTRA, 113
 LINEAR ACCELERATORS, 191, 200
 LINEARIZATION, 168
 LIQUEFIED NATURAL GAS, 54
 LIQUID LITHIUM, 200
 LIQUID METALS, 51, 72
 LIQUID NITROGEN, 50
 LIQUID OXYGEN, 42, 53
 LIQUID PROPELLANT ROCKET
 ENGINES, 42
 LIQUID ROCKET PROPELLANTS, 42,
 53
 LIQUID SLOSHING, 71
 LIQUID SURFACES, 244, 247
 LITHIUM BATTERIES, 65, 66, 92, 93,
 94, 95, 96
 LITHIUM FLUORIDES, 198
 LITHIUM SULFUR BATTERIES, 91
 LITHOLOGY, 89
 LOADS (FORCES), 40, 155
 LOCAL AREA NETWORKS, 63
 LOGARITHMS, 166, 182, 188
 LOOPS, 70
 LOW ALTITUDE, 102
 LOW CONDUCTIVITY, 49
 LOW COST, 29
 LOW EARTH ORBITS, 117
 LOW FREQUENCIES, 135
 LUMINESCENCE, 75
 LUMINOSITY, 230
 LUNAR EXPLORATION, 251, 252, 253
 LUNAR GRAVITATIONAL EFFECTS,
 16

LUNAR SPACECRAFT, 29
 LUNG MORPHOLOGY, 157
 LUNGS, 157
 LYMPHOCYTES, 133
 LYSOZYME, 197

M

MACHINE LEARNING, 227
 MACHINING, 47
 MACROMOLECULES, 197
 MACROPHAGES, 135
 MAGNESIUM OXIDES, 197
 MAGNETIC BEARINGS, 180
 MAGNETIC DISTURBANCES, 115
 MAGNETIC FIELD CONFIGU-
 RATIONS, 206, 211
 MAGNETIC FIELDS, 190, 209, 248, 249
 MAGNETIC FLUX, 249
 MAGNETIC PERMEABILITY, 212
 MAGNETIC PROPERTIES, 204, 211,
 212
 MAGNETIC SUSPENSION, 180
 MAGNETIZATION, 199, 212
 MAGNETOHYDRODYNAMIC FLOW,
 72, 248
 MAGNETOHYDRODYNAMIC STA-
 BILITY, 205
 MAGNETOHYDRODYNAMIC
 WAVES, 207, 208
 MAGNETOHYDRODYNAMICS, 208,
 249
 MAGNETOSPHERES, 239
 MAMMARY GLANDS, 131, 133, 136,
 137, 138, 139, 141, 194
 MAN ENVIRONMENT INTER-
 ACTIONS, 86
 MANAGEMENT PLANNING, 134
 MANAGEMENT SYSTEMS, 15, 151,
 222
 MANNED SPACE FLIGHT, 252, 253
 MANNED SPACECRAFT, 165
 MANUAL CONTROL, 169
 MANUALS, 193, 197
 MANUFACTURING, 169
 MARINE ENVIRONMENTS, 128
 MARINE METEOROLOGY, 101
 MARS (PLANET), 243
 MARS ATMOSPHERE, 117, 247
 MARS ENVIRONMENT, 247
 MARS EXPLORATION, 247, 251, 252,
 253
 MARS GLOBAL SURVEYOR, 247
 MARS MISSIONS, 162
 MARS PATHFINDER, 117
 MARS SAMPLE RETURN MISSIONS,
 244

MARS SURFACE, 115, 231, 244, 246,
 247
 MARS SURFACE SAMPLES, 247
 MARSHLANDS, 89
 MASS, 230
 MASS DISTRIBUTION, 241
 MASS SPECTROMETERS, 191
 MASS SPECTROSCOPY, 247
 MASSIVE STARS, 232, 235, 236
 MASSIVELY PARALLEL PROC-
 ESSORS, 173
 MATHEMATICAL LOGIC, 67
 MATHEMATICAL MODELS, 50, 58,
 65, 82, 83, 86, 112, 120, 166, 172,
 174, 185, 193, 198, 199, 201, 214,
 232
 MATHEMATICAL PROGRAMMING,
 67
 MATHEMATICS, 219
 MATRICES (MATHEMATICS), 188
 MATRIX MANAGEMENT, 76
 MATRIX MATERIALS, 139
 MEAN SQUARE VALUES, 45
 MEASUREMENT, 169
 MEASURING INSTRUMENTS, 195
 MECHANICAL PROPERTIES, 50, 81
 MECHANICAL SHOCK, 183
 MEDICAL SERVICES, 132, 136, 137
 MEMBRANE STRUCTURES, 52, 83
 MEMBRANES, 53
 MENTAL PERFORMANCE, 155, 164
 MERCURY (METAL), 98
 MERCURY (PLANET), 245
 MERCURY SURFACE, 245
 MESONS, 199
 MESOSCALE PHENOMENA, 111, 126
 MESOSPHERE, 104, 113
 MESSAGE PROCESSING, 73
 MESSAGES, 59, 73
 METABOLIC DISEASES, 5
 METABOLISM, 132, 148
 METAL FATIGUE, 48
 METAL MATRIX COMPOSITES, 39
 METAL OXIDE SEMICONDUCTORS,
 210
 METAL SURFACES, 96
 METALLURGY, 99
 METALS, 214
 METASTABLE STATE, 244
 METEORITIC COMPOSITION, 241
 METEOROLOGICAL INSTRUMENTS,
 127
 METEOROLOGICAL PARAMETERS,
 102, 118, 119, 122, 124, 128
 METEOROLOGY, 101, 122
 METHANE, 102, 113

METHYL ALCOHOL, 42
 METRIC SPACE, 187, 189
 METROLOGY, 57
 MICE, 133
 MICHELL THEOREM, 83
 MICROELECTROMECHANICAL SYSTEMS, 234
 MICROGRAVITY, 36, 55, 56, 138, 162
 MICROMETEORITES, 49
 MICROMETEOROLOGY, 98
 MICROORGANISMS, 129, 130, 135
 MICROPROCESSORS, 3
 MICROSATELLITES, 30
 MICROSTRUCTURE, 51, 209, 212
 MICROWAVE AMPLIFIERS, 64
 MICROWAVE CIRCUITS, 226
 MICROWAVE SOUNDING, 61, 62
 MICROWAVE TUBES, 64
 MICROWAVES, 87
 MILITARY OPERATIONS, 132, 148, 158, 186
 MILITARY PSYCHOLOGY, 159
 MILITARY TECHNOLOGY, 27, 132, 158
 MILITARY VEHICLES, 165
 MINERAL DEPOSITS, 84
 MINERALOGY, 84, 109
 MINES (EXCAVATIONS), 59
 MINIMAL SURFACES, 187
 MIRRORS, 203, 204
 MISALIGNMENT, 33
 MISSILE DETECTION, 35
 MISSION PLANNING, 14, 18, 24, 216, 217, 244
 MIXED OXIDES, 200
 MIXING, 108
 MOBILE COMMUNICATION SYSTEMS, 60
 MODELS, 47, 108, 154, 210, 240
 MOISTURE CONTENT, 247
 MOLECULAR CLOUDS, 239
 MOLECULAR ELECTRONICS, 191
 MOLECULAR SPECTROSCOPY, 242
 MOLECULES, 50, 113
 MOMENTUM, 32, 77
 MONATOMIC GASES, 239
 MONITORS, 151
 MONTE CARLO METHOD, 40, 198
 MORPHOLOGY, 57
 MORTALITY, 136
 MOSSBAUER EFFECT, 109
 MOTION SICKNESS, 145, 161
 MOTION STABILITY, 22
 MULTICHANNEL COMMUNICATION, 60, 61

MULTIDISCIPLINARY RESEARCH, 227
 MULTIGRID METHODS, 168
 MULTIMEDIA, 135, 159, 177
 MUSCULAR FUNCTION, 156
 MUSCULAR STRENGTH, 155
 MUSCULOSKELETAL SYSTEM, 135

N

NANOSATELLITES, 30
 NANOSTRUCTURES (DEVICES), 55, 213, 214
 NANOTECHNOLOGY, 68, 209, 213
 NANOTUBES, 69, 209, 210, 212, 213, 214
 NAPHTHALENE, 38
 NARCOLEPSY, 148
 NASA PROGRAMS, 55, 67, 176, 219, 220, 222, 229
 NASA SPACE PROGRAMS, 230
 NAVIER-STOKES EQUATION, 23, 71
 NAVIGATION, 15
 NAVY, 158
 NEAR INFRARED RADIATION, 236
 NEGATIVE IONS, 244
 NEODYMIUM LASERS, 79
 NETHERLANDS, 158, 159
 NETWORK SYNTHESIS, 174
 NETWORKS, 131
 NEURAL NETS, 153, 154, 171, 180
 NEUTRINOS, 199
 NEUTRON SCATTERING, 213
 NEUTRON SOURCES, 200
 NEUTRON STARS, 250
 NEXT GENERATION SPACE TELESCOPE PROJECT, 203
 NICKEL, 47
 NICKEL CADMIUM BATTERIES, 93
 NICKEL HYDROGEN BATTERIES, 64, 65, 92, 93
 NIGHT VISION, 160
 NIGHTGLOW, 58
 NITRIC ACID, 115
 NITRIC OXIDE, 140
 NITROGEN, 250
 NITROGEN 15, 237
 NITROGEN OXIDES, 104
 NITROUS OXIDES, 27
 NOISE (SOUND), 128, 193
 NOISE INTENSITY, 192
 NOISE MEASUREMENT, 12, 90, 192
 NOISE POLLUTION, 193
 NOISE REDUCTION, 193
 NOISE SPECTRA, 78
 NONEQUILIBRIUM FLOW, 37

NONLINEAR EQUATIONS, 86, 168, 181
 NONLINEAR FEEDBACK, 17
 NONLINEAR SYSTEMS, 41
 NONLINEARITY, 206
 NORMAL DENSITY FUNCTIONS, 16
 NORTH ATLANTIC TREATY ORGANIZATION (NATO), 147
 NOZZLE FLOW, 208
 NUCLEAR FUSION, 240
 NUCLEAR MAGNETIC RESONANCE, 44
 NUCLEAR PHYSICS, 197
 NUCLEAR PROPULSION, 36, 37
 NUCLEAR REACTIONS, 196, 240
 NUCLEAR REACTORS, 184
 NUCLEAR ROCKET ENGINES, 36
 NUCLEAR STRUCTURE, 197
 NUCLEAR WEAPONS, 181
 NUMERICAL ANALYSIS, 38, 72, 166, 184
 NUMERICAL WEATHER FORECASTING, 122, 124, 125
 NUTATION, 21
 NUTRIENTS, 164
 NUTRITION, 164

O

O RING SEALS, 81
 OBESITY, 149
 OBJECT-ORIENTED PROGRAMMING, 170, 172, 174
 OBSTACLE AVOIDANCE, 80
 OCEAN BOTTOM, 193
 OCEAN MODELS, 106, 128
 OCEAN TEMPERATURE, 128
 ON-LINE SYSTEMS, 224
 ONBOARD DATA PROCESSING, 192
 OPACITY, 246
 OPERATING SYSTEMS (COMPUTERS), 170
 OPERATING TEMPERATURE, 72
 OPERATIONAL CALCULUS, 188
 OPERATIONAL PROBLEMS, 4
 OPERATIONS RESEARCH, 186
 OPERATORS (MATHEMATICS), 187
 OPHTHALMOLOGY, 4
 OPTICAL COMMUNICATION, 61
 OPTICAL EQUIPMENT, 205
 OPTICAL FIBERS, 61, 202
 OPTICAL MATERIALS, 43
 OPTICAL PROPERTIES, 29, 43, 46, 68, 230
 OPTICAL RADAR, 78, 80, 103, 109, 114, 125
 OPTICAL THICKNESS, 102, 118

OPTIMIZATION, 174, 206
 ORBIT CALCULATION, 15
 ORBIT DETERMINATION, 19, 20
 ORBITAL ELEMENTS, 250
 ORBITAL MECHANICS, 18
 ORDNANCE, 77
 ORGANIC COMPOUNDS, 246
 ORGANIC MATERIALS, 43, 231
 ORGANIZATIONS, 175, 222
 ORIFICES, 56
 OSCILLATIONS, 2, 106, 199
 OSTEOBLASTS, 135
 OUTCROPS, 84, 86
 OVERHAUSER EFFECT, 44
 OXIDATION, 98
 OXYGEN, 161, 162, 239
 OXYGEN ATOMS, 29
 OXYGEN IONS, 240
 OXYGEN ISOTOPES, 241
 OZONE, 102, 104, 105, 109
 OZONE DEPLETION, 101, 120
 OZONOMETRY, 101, 105, 115

P

PACIFIC ISLANDS, 101
 PAINTS, 52
 PAIR PRODUCTION, 197
 PALLADIUM, 212
 PARABOLIC FLIGHT, 155
 PARALLEL COMPUTERS, 173
 PARALLEL FLOW, 23
 PARALLEL PROCESSING (COMPUTERS), 3
 PARALLEL PROGRAMMING, 176
 PARAMAGNETISM, 212
 PARAMETERIZATION, 112, 224
 PARASITIC DISEASES, 144
 PARTIAL DIFFERENTIAL EQUATIONS, 187
 PARTICLE ACCELERATORS, 196, 201
 PARTICLE INTERACTIONS, 127
 PARTICLE SIZE DISTRIBUTION, 102
 PARTICLE TRAJECTORIES, 115
 PARTICLES, 195
 PARTONS, 195
 PATHOGENS, 138
 PATTERN RECOGNITION, 77
 PATTERN REGISTRATION, 178
 PAYLOAD INTEGRATION, 30
 PAYLOADS, 13, 14, 15, 25, 26, 29, 30
 PEENING, 48
 PENETRATION, 41, 191
 PERFORMANCE PREDICTION, 25, 63, 71, 234

PERFORMANCE TESTS, 7, 33, 51, 54, 60, 61, 66, 69, 92, 93, 94, 95, 164
 PERIODIC VARIATIONS, 89, 106
 PEROVSKITES, 88
 PERSONAL COMPUTERS, 169, 170
 PERSONNEL, 222
 PERSONNEL MANAGEMENT, 63
 PERSONNEL SELECTION, 164
 PERTURBATION, 42, 134
 PHARMACOLOGY, 142, 143, 145, 146, 147, 148
 PHASE CHANGE MATERIALS, 70
 PHASE DIAGRAMS, 211
 PHASE MATCHING, 202
 PHASE MODULATION, 68
 PHASE TRANSFORMATIONS, 213
 PHENOLS, 156
 PHOSPHINES, 47
 PHOTOCATHODES, 78
 PHOTOCHEMICAL REACTIONS, 111
 PHOTODETACHMENT, 197
 PHOTODISSOCIATION, 232
 PHOTOELECTRON SPECTROSCOPY, 197
 PHOTOLYSIS, 237
 PHOTOMETERS, 118, 232
 PHOTON BEAMS, 199
 PHOTONS, 202, 217, 240
 PHOTOSYNTHESIS, 99, 130
 PHOTOVOLTAIC CELLS, 97
 PHYSICAL EXERCISE, 149, 156
 PHYSICIANS, 151
 PHYSIOLOGICAL EFFECTS, 132, 145
 PHYSIOLOGICAL FACTORS, 149
 PHYSIOLOGICAL RESPONSES, 147, 152, 153
 PHYSIOLOGICAL TESTS, 147
 PHYSIOLOGY, 129, 141
 PHYTOPLANKTON, 140
 PILOT TRAINING, 11
 PLANETARY ATMOSPHERES, 232, 236
 PLANETARY CRUSTS, 115
 PLANETARY EVOLUTION, 115, 237
 PLANETARY GEOLOGY, 115, 246
 PLANETARY MANTLES, 115
 PLANETARY NEBULAE, 237
 PLANETARY ORBITS, 237
 PLANETARY ROTATION, 154
 PLANETARY SYSTEMS, 13, 216, 229, 232
 PLANETARY TEMPERATURE, 244
 PLASMA ACCELERATION, 208
 PLASMA DYNAMICS, 239
 PLASMA GENERATORS, 206
 PLASMA PHYSICS, 202, 207, 208, 239

PLASMAS (PHYSICS), 72, 206, 207, 208
 PLASMASPHERE, 110
 PLASTIC PROPERTIES, 210
 PLATES (TECTONICS), 115
 PLUMES, 9, 37
 PLUTO (PLANET), 236
 POINTING CONTROL SYSTEMS, 34
 POISSON DENSITY FUNCTIONS, 185
 POLAR METEOROLOGY, 107, 111, 120
 POLAR ORBITS, 14
 POLAR REGIONS, 110
 POLARIMETERS, 198
 POLICIES, 26, 223
 POLLUTION MONITORING, 98
 POLYCYCLIC AROMATIC HYDROCARBONS, 38, 240, 241, 242, 245
 POLYMER BLENDS, 50
 POLYMERIZATION, 50
 POLYMERS, 10, 44, 45, 49, 50
 POLYNOMIALS, 166, 182, 183, 188
 POROSITY, 83, 182
 POROUS MATERIALS, 42, 83, 182
 POSITION (LOCATION), 122, 231
 POSITIVE FEEDBACK, 89
 POSTURE, 165
 POTENTIAL FLOW, 71
 POWDER (PARTICLES), 39, 51
 POWER EFFICIENCY, 64
 POWER SPECTRA, 71, 194
 PRECIPITATION (METEOROLOGY), 119, 120, 124
 PREDICTION ANALYSIS TECHNIQUES, 101
 PREDICTIONS, 49, 106
 PREDICTOR-CORRECTOR METHODS, 186
 PRELAUNCH SUMMARIES, 27
 PRELAUNCH TESTS, 27
 PREMIXED FLAMES, 185
 PRESSURE, 247
 PRESSURE BREATHING, 162
 PRESSURE GRADIENTS, 205
 PRESSURE MEASUREMENT, 75
 PRESSURE SENSITIVE PAINTS, 75
 PRESSURE SUITS, 162
 PRESSURE VESSELS, 93
 PRESSURIZED WATER REACTORS, 184
 PREVENTION, 149
 PRINTED CIRCUITS, 174
 PROBABILITY DENSITY FUNCTIONS, 185, 194
 PROBABILITY THEORY, 7, 16, 121
 PROBES, 141

PROBLEM SOLVING, 101
 PROGRAM VERIFICATION (COM-
 PUTERS), 6, 67, 170, 176
 PROGRAMMING LANGUAGES, 67
 PROJECT MANAGEMENT, 190, 222
 PROJECT PLANNING, 23, 24, 27, 29,
 103
 PROJECTILES, 68
 PROPELLANT COMBUSTION, 42
 PROPELLANT PROPERTIES, 53
 PROPELLANT STORABILITY, 53
 PROPELLER BLADES, 57
 PROPHYLAXIS, 144
 PROPRIOCEPTION, 165
 PROPULSION SYSTEM CONFIGU-
 RATIONS, 36, 244
 PROPULSION SYSTEM PER-
 FORMANCE, 36, 208, 244
 PROSTATE GLAND, 129, 131
 PROTECTION, 79, 175
 PROTECTIVE COATINGS, 53
 PROTEINS, 131, 135, 139, 140
 PROTOBIOLOGY, 43
 PROTOCOL (COMPUTERS), 61, 178
 PROTONS, 196
 PROTOPLANETARY DISKS, 237
 PROTOSTARS, 237
 PROVING, 203
 PSYCHOLOGICAL EFFECTS, 157, 158
 PUBLIC HEALTH, 149, 163
 PUBLIC RELATIONS, 215, 217
 PULMONARY FUNCTIONS, 157
 PULSE AMPLITUDE, 152
 PULSE DETONATION ENGINES, 82
 PULSED LASERS, 39
 PURGING, 98

Q

QUALIFICATIONS, 33
 QUALITY CONTROL, 98, 150, 162
 QUANTITATIVE ANALYSIS, 46
 QUANTUM CHROMODYNAMICS,
 201
 QUANTUM COMPUTATION, 191
 QUANTUM DOTS, 214
 QUANTUM ELECTRONICS, 213
 QUANTUM MECHANICS, 45, 197, 215
 QUANTUM OPTICS, 198
 QUANTUM STATISTICS, 45
 QUANTUM THEORY, 191, 198
 QUANTUM WIRES, 214
 QUENCHING, 55, 56
 QUERY LANGUAGES, 225

R

RADAR ANTENNAS, 59
 RADAR DETECTION, 127
 RADAR EQUIPMENT, 12
 RADAR IMAGERY, 33
 RADAR MEASUREMENT, 114, 115
 RADAR TARGETS, 78
 RADAR TRACKING, 87
 RADAR TRANSMITTERS, 59
 RADARSAT, 33
 RADIANCE, 105, 122
 RADIATION ABSORPTION, 107
 RADIATION DOSAGE, 181
 RADIATION EFFECTS, 18, 29, 195
 RADIATION HAZARDS, 181
 RADIATION MEASUREMENT, 100,
 122, 126
 RADIATION SHIELDING, 40
 RADIATION SOURCES, 64
 RADIATION TRANSPORT, 105
 RADIATIVE HEAT TRANSFER, 103
 RADIATIVE TRANSFER, 18, 73, 124,
 126, 214
 RADICALS, 245
 RADIO ASTRONOMY, 239
 RADIO COMMUNICATION, 59, 73
 RADIO EQUIPMENT, 60
 RADIO FREQUENCIES, 63
 RADIOACTIVE ISOTOPES, 67
 RADIOACTIVITY, 181, 202
 RADIOGRAPHY, 196
 RADIOMETERS, 33, 35, 74, 78, 102,
 107, 122
 RAIN, 119, 121, 126
 RAMAN SPECTRA, 205
 RANDOM NOISE, 154
 RANDOM SAMPLING, 32
 RANGEFINDING, 3, 245
 RAPID TRANSIT SYSTEMS, 54
 RARE EARTH ELEMENTS, 226
 RASTER SCANNING, 21
 RATS, 134
 REACTING FLOW, 186
 REACTION KINETICS, 186, 240
 REACTION PRODUCTS, 51
 REACTION WHEELS, 31
 REACTIVITY, 51
 READ-ONLY MEMORY DEVICES, 135
 READOUT, 74
 REAL TIME OPERATION, 8, 35, 59, 61,
 112, 118
 RECEIVERS, 60, 61, 194
 RECOMMENDATIONS, 225
 RECONNAISSANCE, 164
 RECORDING INSTRUMENTS, 78, 193

RECORDS MANAGEMENT, 223
 RECTANGLES, 183
 RECYCLING, 97, 165
 REDUNDANCY, 31
 REENTRY TRAJECTORIES, 14, 20
 REFLECTANCE, 105
 REGRESSION ANALYSIS, 134, 227
 REGULATIONS, 97
 RELAXATION METHOD (MATH-
 EMATICS), 168
 RELAXATION TIME, 210
 RELIABILITY ANALYSIS, 234
 REMOTE CONTROL, 226
 REMOTE SENSING, 13, 87, 90, 103,
 104, 107, 109, 117, 119, 123, 125,
 135, 178
 REMOTE SENSORS, 88
 REPEATERS, 250
 RESEARCH, 195, 215, 219
 RESEARCH AND DEVELOPMENT, 1,
 13, 101, 132, 177, 190, 204, 219,
 222, 229
 RESEARCH MANAGEMENT, 107, 222
 RESEARCH PROJECTS, 229
 RESERVOIRS, 84, 86
 RESIDUAL STRESS, 58
 RESOLUTION, 169
 RESONANCE SCATTERING, 200
 RESONANT FREQUENCIES, 194
 RESPIRATION, 162
 RESPIRATORY PHYSIOLOGY, 143,
 157
 RESPIRATORY SYSTEM, 132, 134
 RESPONSE TIME (COMPUTERS), 170
 RESPONSES, 153
 REUSABLE LAUNCH VEHICLES, 23,
 36
 REUSABLE SPACECRAFT, 24
 REVERBERATION, 69
 REYNOLDS EQUATION, 71
 REYNOLDS NUMBER, 2
 RIEMANN MANIFOLD, 188, 189
 RIESZ THEOREM, 188
 RIGID STRUCTURES, 71
 RISK, 14, 149, 150, 168, 178, 244
 ROBOTICS, 180, 252
 ROBOTS, 180
 ROCKET ENGINE DESIGN, 36, 208
 ROCKET ENGINES, 35, 36, 37
 ROCKET NOZZLES, 43
 ROCKS, 116, 171
 ROOT-MEAN-SQUARE ERRORS, 10
 ROTARY WINGS, 160
 ROTATING SHAFTS, 81
 ROTORS, 71, 192
 ROUTES, 3

S

- SAFETY, 3, 95, 168, 223
- SAFETY FACTORS, 4
- SATELLITE ATMOSPHERES, 246
- SATELLITE ATTITUDE CONTROL, 6, 18, 21, 32
- SATELLITE COMMUNICATION, 60
- SATELLITE CONFIGURATIONS, 30
- SATELLITE CONSTELLATIONS, 18, 19
- SATELLITE CONTROL, 18
- SATELLITE DESIGN, 25
- SATELLITE GUIDANCE, 17
- SATELLITE IMAGERY, 118
- SATELLITE INSTRUMENTS, 24, 107
- SATELLITE LASER RANGING, 19
- SATELLITE OBSERVATION, 33, 87, 90, 111, 112, 115, 118, 125, 126
- SATELLITE ORIENTATION, 15, 20, 21, 22, 28, 31, 32, 33, 34, 35, 76
- SATELLITE SOUNDING, 118
- SATELLITE-BORNE INSTRUMENTS, 105
- SCALE MODELS, 3, 206
- SCANNING TUNNELING MICROSCOPY, 47
- SCATTERING, 63, 214
- SCATTERING CROSS SECTIONS, 63, 195, 196, 200
- SCATTEROMETERS, 20
- SCHEDULES, 3
- SCHEDULING, 15, 61
- SCHOOLS, 101, 176, 221, 233
- SCHROEDINGER EQUATION, 181
- SCIENTIFIC VISUALIZATION, 220, 227
- SCREWS, 57
- SEA SURFACE TEMPERATURE, 128
- SECONDARY FLOW, 71
- SECURITY, 4
- SEDIMENTS, 89, 109, 130
- SELF ALIGNMENT, 68
- SELF ORGANIZING SYSTEMS, 223
- SEMANTICS, 227
- SEMICONDUCTING FILMS, 210
- SEMICONDUCTOR DIODES, 80
- SEMICONDUCTOR LASERS, 80
- SEMISPAN MODELS, 3
- SENSORS, 35, 128
- SENSORY FEEDBACK, 154
- SERVICE LIFE, 65, 66, 92, 93, 94, 95
- SET THEORY, 187, 189
- SHAFTS (MACHINE ELEMENTS), 82
- SHAPE FUNCTIONS, 166
- SHAPE MEMORY ALLOYS, 37
- SHAPE OPTIMIZATION, 57
- SHAPES, 107, 214
- SHEAR PROPERTIES, 48
- SHEARING, 48
- SHELTERS, 161
- SHOCK TESTS, 183
- SHOCK TUBES, 73
- SHOCK TUNNELS, 9, 208
- SHOCK WAVE PROPAGATION, 82, 183
- SHOCK WAVES, 183
- SHORT CIRCUITS, 66
- SICKNESSES, 151
- SIGNAL DETECTION, 69, 194
- SIGNAL TO NOISE RATIOS, 110
- SIGNS AND SYMPTOMS, 153, 158
- SILICON, 39
- SILICON CARBIDES, 45, 58, 211
- SILICON COMPOUNDS, 37
- SILICONES, 242
- SILVER ZINC BATTERIES, 64, 94
- SIMULATION, 37, 77, 106, 119, 129, 154, 181, 208
- SIMULATORS, 10, 22, 171
- SINE WAVES, 66
- SINGLE CRYSTALS, 38
- SKIN FRICTION, 130, 208
- SLOPES, 8
- SMART MATERIALS, 210
- SMART STRUCTURES, 8
- SNC METEORITES, 241
- SOBOLEV SPACE, 189
- SOFTWARE DEVELOPMENT TOOLS, 167, 173, 176, 226
- SOFTWARE ENGINEERING, 6, 168, 169, 171, 175, 225
- SOIL SCIENCE, 171
- SOILS, 99, 116
- SOL-GEL PROCESSES, 226
- SOLAR ACTIVITY EFFECTS, 230, 248, 249
- SOLAR ARRAYS, 37
- SOLAR CORONA, 249
- SOLAR CYCLES, 248
- SOLAR ENERGY, 97
- SOLAR HEATING, 126
- SOLAR PROTONS, 104
- SOLAR RADIATION, 236
- SOLAR SYSTEM, 216, 232
- SOLAR TERRESTRIAL INTER-ACTIONS, 230
- SOLAR WIND, 240, 248
- SOLID CRYOGENS, 47
- SOLIDIFIED GASES, 47
- SOLITARY WAVES, 202
- SOLUTES, 86
- SOLVATION, 42
- SONAR, 194
- SOUND PROPAGATION, 193
- SOUND TRANSMISSION, 193
- SOUNDING, 121
- SOUTH CAROLINA, 85
- SPACE BASED RADAR, 205
- SPACE EXPLORATION, 13, 40, 149, 163, 216, 217, 219, 247, 251
- SPACE FLIGHT, 186
- SPACE MISSIONS, 13, 14, 67, 163, 203, 216, 217, 245
- SPACE OBSERVATIONS (FROM EARTH), 249
- SPACE PLATFORMS, 29
- SPACE PROGRAMS, 186, 251
- SPACE SHUTTLE MISSIONS, 22, 157
- SPACE SHUTTLE PAYLOADS, 15, 27
- SPACE SHUTTLES, 54
- SPACE STATIONS, 15
- SPACE TRANSPORTATION, 23
- SPACE WEATHER, 186, 230, 249
- SPACEBORNE EXPERIMENTS, 14, 24
- SPACECRAFT BREAKUP, 14
- SPACECRAFT CABINS, 165
- SPACECRAFT CONFIGURATIONS, 29
- SPACECRAFT CONTROL, 10, 17, 19, 31, 76, 170
- SPACECRAFT DESIGN, 230
- SPACECRAFT ELECTRONIC EQUIPMENT, 25
- SPACECRAFT EQUIPMENT, 14
- SPACECRAFT INSTRUMENTS, 172, 205
- SPACECRAFT LAUNCHING, 23, 26, 27, 29
- SPACECRAFT MAINTENANCE, 22
- SPACECRAFT MODELS, 22, 171
- SPACECRAFT MODULES, 165
- SPACECRAFT ORBITS, 16
- SPACECRAFT PERFORMANCE, 34
- SPACECRAFT POWER SUPPLIES, 64, 65, 66, 91, 92, 93, 94
- SPACECRAFT PROPULSION, 27, 36, 53, 163
- SPACECRAFT REENTRY, 14
- SPACECRAFT STRUCTURES, 83
- SPACECRAFT TRAJECTORIES, 16, 17, 20, 31
- SPACECREWS, 165
- SPATIAL DISTRIBUTION, 32
- SPECIFIC IMPULSE, 208
- SPECIFICATIONS, 25, 29, 224
- SPECTRA, 96
- SPECTRAL REFLECTANCE, 125
- SPECTROGRAPHS, 191
- SPECTRORADIOMETERS, 74
- SPECTROSCOPIC ANALYSIS, 138

SPECTROSCOPY, 77
 SPECTRUM ANALYSIS, 78, 98, 113, 246
 SPEECH, 59
 SPEED CONTROL, 10
 SPHERES, 63
 SPHEROIDS, 107
 SPIN EXCHANGE, 210
 SPIN STABILIZATION, 22, 31
 SPOT (FRENCH SATELLITE), 115
 SPRAYED COATINGS, 96
 SPRINGS (ELASTIC), 84, 210
 STABILITY, 205, 206, 212
 STABILITY AUGMENTATION, 205
 STABILITY TESTS, 205
 STANDARDIZATION, 25, 149, 219, 223
 STANDARDS, 163
 STAR FORMATION, 236, 237
 STAR TRACKERS, 34, 78
 STARBURST GALAXIES, 233, 234
 STATISTICAL ANALYSIS, 110, 124, 127, 185
 STATISTICAL CORRELATION, 12
 STATISTICAL MECHANICS, 215
 STATISTICAL TESTS, 185
 STATISTICAL WEATHER FORECASTING, 122
 STEAM, 47, 56
 STEELS, 81
 STELLAR ACTIVITY, 235
 STELLAR ATMOSPHERES, 243
 STELLAR COLOR, 235
 STELLAR EVOLUTION, 235, 243
 STELLAR INTERIORS, 243
 STELLAR MASS, 231, 235, 241
 STELLAR MODELS, 242
 STELLAR OSCILLATIONS, 230
 STELLAR PHYSICS, 243
 STELLAR SYSTEMS, 203
 STELLARATORS, 205, 207
 STIRRING, 179
 STOCHASTIC PROCESSES, 70, 82, 119, 172
 STORAGE BATTERIES, 91, 96
 STORAGE RINGS (PARTICLE ACCELERATORS), 202
 STORAGE STABILITY, 66
 STORMS, 110
 STORMS (METEOROLOGY), 127
 STRATOSPHERE, 100, 101, 104, 108, 109, 111, 113, 114, 115, 120
 STRATUS CLOUDS, 123
 STRESS (PHYSIOLOGY), 153
 STRESS (PSYCHOLOGY), 158
 STRESS ANALYSIS, 41, 83
 STRESS CONCENTRATION, 48

STRESS CORROSION CRACKING, 8, 48
 STRUCTURAL ANALYSIS, 33, 48, 203, 205
 STRUCTURAL DESIGN, 30, 57, 97
 STRUCTURAL PROPERTIES (GEOLOGY), 116
 STRUCTURAL RELIABILITY, 40
 STRUCTURAL VIBRATION, 235
 STRUCTURED PROGRAMMING, 225
 STUDENTS, 118, 176, 218, 219, 233
 SUBGROUPS, 188
 SUBMILLIMETER WAVES, 113
 SULFUR OXIDES, 32
 SULFURIC ACID, 100
 SUN, 186, 230
 SUNLIGHT, 105, 118
 SUPERCOMPUTERS, 173, 176, 224
 SUPERCONDUCTIVITY, 209
 SUPERCONDUCTORS (MATERIALS), 210
 SUPERCRITICAL FLOW, 42
 SUPERCRITICAL FLUIDS, 42
 SUPERGIANT STARS, 235, 243
 SUPERSONIC COMBUSTION RAMJET ENGINES, 9, 208
 SUPERSONIC FLOW, 208
 SUPERSONIC NOZZLES, 208
 SUPERSONIC TRANSPORTS, 130
 SUPERSYMMETRY, 196, 201
 SUPPORT SYSTEMS, 216, 218
 SUPPORTS, 22
 SUPPRESSORS, 131
 SURFACE COOLING, 98
 SURFACE ENERGY, 91
 SURFACE FINISHING, 48, 58
 SURFACE GEOMETRY, 57
 SURFACE LAYERS, 123
 SURFACE PROPERTIES, 123
 SURFACE TEMPERATURE, 98, 236, 244, 247
 SURFACTANTS, 157
 SURGERY, 136
 SURVEILLANCE, 128
 SURVEYS, 1
 SYNCHRONISM, 167
 SYNOPTIC METEOROLOGY, 114
 SYNTAX, 227
 SYNTHESIS (CHEMISTRY), 213
 SYNTHETIC APERTURE RADAR, 33, 59, 77
 SYSTEMS ANALYSIS, 4, 164, 184, 215
 SYSTEMS ENGINEERING, 4, 26, 36, 57, 62, 90, 160, 162, 169, 172, 174
 SYSTEMS INTEGRATION, 178
 SYSTEMS MANAGEMENT, 150

T

TABLES (DATA), 75
 TARGET ACQUISITION, 77
 TARGET RECOGNITION, 185
 TASKS, 164
 TDR SATELLITES, 32
 TEAMS, 63
 TECHNOLOGIES, 101, 177, 219
 TECHNOLOGY ASSESSMENT, 25, 73, 229
 TECHNOLOGY TRANSFER, 204, 216
 TECHNOLOGY UTILIZATION, 30, 73, 217, 226, 229, 249
 TELECOMMUNICATION, 168
 TELEPHONY, 59, 178
 TELESCOPES, 203
 TEMPERATE REGIONS, 121
 TEMPERATURE CONTROL, 29, 72
 TEMPERATURE DEPENDENCE, 44, 75, 212
 TEMPERATURE EFFECTS, 33, 140
 TEMPERATURE MEASUREMENT, 1, 12, 120
 TEMPERATURE MEASURING INSTRUMENTS, 122
 TEMPERATURE PROFILES, 77
 TEMPORAL RESOLUTION, 77
 TERMINAL BALLISTICS, 49, 191
 TERRAIN, 60
 TEST CHAMBERS, 9
 TEST FACILITIES, 62, 192
 TEXTS, 223
 THEOREM PROVING, 168, 188
 THEOREMS, 183, 187, 189
 THERAPY, 131, 133, 136, 139, 141
 THERMAL CONDUCTIVITY, 91, 108
 THERMAL CONTROL COATINGS, 38
 THERMAL CYCLING TESTS, 92
 THERMAL EMISSION, 239
 THERMAL INSULATION, 49
 THERMAL PROTECTION, 52
 THERMAL STABILITY, 38, 96, 235
 THERMAL STRESSES, 236
 THERMOCLINES, 128
 THERMODYNAMICS, 47, 70
 THERMOELECTRIC GENERATORS, 67
 THERMOLUMINESCENCE, 198
 THERMOPHILES, 113
 THERMOPHOTOVOLTAIC CONVERSION, 96
 THERMOREGULATION, 140
 THIN FILMS, 210
 THIN WALLS, 47
 THREE BODY PROBLEM, 17

THREE DIMENSIONAL COM-
POSITES, 41
THREE DIMENSIONAL MODELS, 59,
71, 102, 206, 249
THRUST-WEIGHT RATIO, 36
THUNDERSTORMS, 119
TIME CONSTANT, 183
TIME FUNCTIONS, 183
TIME MEASUREMENT, 169
TIME OF FLIGHT SPECTROMETERS,
191
TIME SERIES ANALYSIS, 71, 119, 121
TIN, 54
TITAN, 244
TITANIUM, 48, 191
TITANIUM ALLOYS, 53, 191
TOKAMAK DEVICES, 207
TOPOGRAPHY, 87
TOPOLOGY, 189
TOROIDAL PLASMAS, 206, 207
TORQUE, 77, 81, 105
TORQUERS, 21
TOUGHNESS, 39
TOWERS, 190
TOXIC HAZARDS, 132
TOXICITY, 132, 157
TOXICOLOGY, 132
TRACE ELEMENTS, 84, 113, 247
TRAFFIC, 6
TRAINING ANALYSIS, 158
TRAINING DEVICES, 11
TRAINING SIMULATORS, 13
TRAJECTORIES, 111
TRAJECTORY CONTROL, 20, 31
TRANSCENDENTAL FUNCTIONS,
189
TRANSFORMERS, 201
TRANSMISSION LOSS, 71
TRANSMITTERS, 190
TRANSONIC FLOW, 71
TRANSONIC WIND TUNNELS, 3, 11
TRANSPORT PROPERTIES, 44, 45, 86,
102, 209, 213
TRANSPORT VEHICLES, 161
TRAPS, 56
TREATMENT, 157
TRENDS, 33
TRIGONOMETRIC FUNCTIONS, 188
TRMM SATELLITE, 119, 124, 126
TROPICAL REGIONS, 116, 126
TROPICAL STORMS, 126
TROPOSPHERE, 78, 102, 108, 109, 111,
114, 127
TUNABLE LASERS, 79
TUNGSTEN, 41, 50
TURBINE ENGINES, 10

TURBINE PUMPS, 23
TURBINES, 10
TURBOFAN ENGINES, 71
TURBOMACHINE BLADES, 57
TURBULENT FLOW, 130
TURBULENT JETS, 185
TWO DIMENSIONAL FLOW, 73
TWO DIMENSIONAL MODELS, 69

U

U-2 AIRCRAFT, 115
ULTRASONIC RADIATION, 78
ULTRASONICS, 153
ULTRAVIOLET LASERS, 39
ULTRAVIOLET RADIATION, 29, 236,
242
UNDERWATER ACOUSTICS, 71, 78
UNDERWATER EXPLOSIONS, 71, 183
UNIVERSE, 216, 241
UNIVERSITIES, 218, 219
UNIVERSITY PROGRAM, 219
UNIX (OPERATING SYSTEM), 225
UNSTEADY AERODYNAMICS, 2
UNSTEADY FLOW, 23
UNSTRUCTURED GRIDS (MATH-
EMATICS), 173
UPPER ATMOSPHERE RESEARCH
SATELLITE (UARS), 115
URANIUM, 46
URBAN DEVELOPMENT, 228
USER MANUALS (COMPUTER PRO-
GRAMS), 196, 198
USER REQUIREMENTS, 23, 24

V

VACUUM FURNACES, 55
VAPOR PHASES, 43
VAPORS, 99
VASIMR (PROPULSION SYSTEM),
163
VASOCONSTRICTOR DRUGS, 147
VEGETATION, 89, 118
VEHICLES, 96
VELOCITY, 68
VELOCITY DISTRIBUTION, 73
VENTILATION, 12
VERBAL COMMUNICATION, 59
VERMICULITE, 84
VERTICAL DISTRIBUTION, 124
VERTICAL MOTION, 121
VERY LARGE SCALE INTEGRATION,
67
VESTIBULAR TESTS, 11
VIBRATION, 82, 110
VIBRATION DAMPING, 72

VIBRATION MEASUREMENT, 58
VIEWING, 161
VINYL COPOLYMERS, 213
VIRTUAL REALITY, 8, 13
VISIBILITY, 170
VISIBLE SPECTRUM, 245
VISUAL PERCEPTION, 79
VOICE COMMUNICATION, 59, 60
VOICE DATA PROCESSING, 60
VOLCANOES, 100
VORTEX AVOIDANCE, 5
VORTEX GENERATORS, 7
VORTICES, 101

W

WAFERS, 206
WAKEFULNESS, 148
WAKES, 5
WALL TEMPERATURE, 12
WARNING SYSTEMS, 4, 80
WATER, 51, 117, 239, 244, 247
WATER FLOW, 171
WATER MANAGEMENT, 87
WATER POLLUTION, 86, 98
WATER QUALITY, 85, 86, 87, 98
WATER RESOURCES, 85, 87
WATER TEMPERATURE, 86
WATER VAPOR, 47, 110, 114, 115, 122
WATER WAVES, 112
WATERSHEDS, 218
WAVE EQUATIONS, 193
WAVE PROPAGATION, 181, 184, 193
WAVELET ANALYSIS, 178
WEATHER, 116
WEATHER FORECASTING, 27, 101,
119, 120, 125
WEATHERING, 247
WEBSITES, 23, 24, 135, 177, 224, 229
WEIGHT ANALYSIS, 36
WEIGHTLESSNESS, 149
WEIGHTLESSNESS SIMULATION,
154, 155
WELDED JOINTS, 80
WELLS, 99
WETLANDS, 87
WHEELS, 180
WHITE DWARF STARS, 242
WHITE NOISE, 134
WIDE AREA NETWORKS, 175
WIND (METEOROLOGY), 108, 117,
125
WIND MEASUREMENT, 58
WIND PROFILES, 125
WIND TUNNEL MODELS, 75
WIND TUNNEL TESTS, 1, 12, 75, 208

WINTER, 120
WIRE, 69, 209
WIRELESS COMMUNICATION, 63
WORK, 151
WORKLOADS (PSYCHOPHYSIOLOGY), 155, 164
WORLD WIDE WEB, 175
WOUND HEALING, 132
WRINKLING, 52

X

X RAY ANALYSIS, 55
X RAY ASTRONOMY, 240
X RAY ASTROPHYSICS FACILITY,
230
X RAY BINARIES, 230
X RAY DIFFRACTION, 97
X RAY LASERS, 202
X RAY OPTICS, 204
X RAY SOURCES, 230, 231
X RAY TIMING EXPLORER, 230
X RAYS, 199, 202, 250
X-33 REUSABLE LAUNCH VEHICLE,
7
X-37 VEHICLE, 36

Y

YAG LASERS, 79
YIELD, 250
YTTERBIUM, 202
YTTERBIUM ISOTOPES, 210

Z

ZENER EFFECT, 69

Personal Author Index

A

Abbaschian, Reza, 54
 Abdurrashid, Jibril, 225
 Abkar, Ali, 188
 Abramovich, Y. I., 61
 Abramovich, Yu. I., 60
 Adams, Brian S., 12
 Adams, Glynn, 80
 Adams, J. H., Jr., 250
 Adams, W. James, 24
 Adekoya, Adeyemi, 176
 Adenwalla, S., 213
 Ahmadjian, M., 35
 Ahmed, J., 52
 Ahumada, Albert, 169
 Ahumada, Albert J., Jr., 169
 Ai, Shang-Kun, 46
 Ai, Wei-Dang, 165
 Airapetian, V., 34
 Aires, Filipe, 87
 Akhmediev, Nail N., 202
 Akridge, Jim, 91
 Alam, M. K., 137
 Albert, Daniel B., 129
 Albright, C. H., 199
 Alena, Rick, 60
 Alfano, R. R., 217
 Alivisatos, Paul, 191
 Allamandola, Louis J., 236, 240, 244
 Almeida, Eduardo A. C., 134
 Almonor, Linda, 118
 Alonso, Roberto, 17
 Alperin, Marc J., 129
 Alvarez, Marino C., 177
 Amaral, Antonio M., 81
 Amaya, Max A., 10
 Amine, K., 96
 Amiranoff, F., 202
 Anandakrishnan, S., 21
 Anantram, M. P., 69, 209, 213
 Andrews, J. W., 56
 Andrews, Lester, 38
 Angelini, Lorella, 230
 Angotti, Catherine M., 149
 Anthony, F., 57
 Archie, Deithra, 237
 Ardanuy, Philip E., 74
 Argon, A. S., 39
 Argyriou, D. N., 211
 Armstrong, J., 166

Armstrong, Thomas J., 202
 Arneson, Vegard, 60
 Arno, Roger D., 162
 Arnold, Susan, 151
 Arthun, Daniel, 171
 Asplund, Shari, 217
 Asraf, D. E., 68
 Athur, S., 210
 Atkins, H. L., 186
 Au, George, 95
 Averner, Maurice M., 247
 Axelrad, Penina, 20

B

Bacaltchuk, C., 209
 Bachelet, D., 118
 Backley, Floyd D., 57
 Bader, S. D., 211, 212
 Baer, Lisa A., 148
 Baer, M. R., 42
 Bagby, William F., 77
 Bagchi, S., 167
 Baker, D. N., 201
 Baker, Robert-Allen, 220
 Baker-Fulco, Carol J., 156
 Bakes, E., 244
 Bakes, E. L. O., 38, 43
 Balachandran, U., 53, 210
 Balazs, Anna C., 50
 Baldwin, C., 118
 Ballas, Linda, 222
 Bar-Itzhack, Itzhack Y., 33, 76
 Barford, Lee, 233
 Barnes, Aaron, 248
 Barnes, Donald, 33
 Barnes, Terence, 2
 Barnes, William L., 74
 Barnette, D. W., 179
 Barrett, Paul, 230
 Barrowman, Jim, 13, 216
 Barry, William, 150, 222
 Bartels, D. M., 42
 Barth, Janet, 186, 229, 249
 Bartholomew, Maureen O., 170
 Basiev, Tasoltan T., 79
 Bates, C. E., 47
 Bates, Kevin R., 195
 Battle, Tamara, 237
 Bauer, Robert, 32

Baum, B. A., 62
 Bauschlicher, Charles W., 38
 Bauschlicher, Charles W., Jr., 37, 38, 43, 197, 212, 244
 Baz, Amr R., 8
 Beardon, A. F., 183
 Beasley, Howard H., 79
 Bebout, Brad M., 129, 130
 Beckmann, B.R., 124
 Beddel, Darren, 26
 Beersma, Jules J., 121
 Beisswenger, Arlene, 46
 Bellamy, Henry D., 54
 Belmont, R. A., 184
 Belova, E. V., 206
 Belur, Sheela V., 75
 Bendler, J. T., 49
 Benson, Alan, 145
 Berger, A., 211, 212
 Berger, E. L., 196, 197, 201
 Berglund, Larry G., 236
 Bergsten, E., 162
 Bergstrom, R. W., 103
 Bernstein, Max P., 236
 Berrick, Stephen, 87
 Berry, Scott A., 12
 Bershuis, P., 213
 Betts, Juan F., 194
 Bevilacqua, R. M., 115
 Bhatia, A. K., 196
 Bi, Hong-Zhe, 154
 Bilanow, Stephen, 22
 Bildhauer, Michael, 189
 Billings, G. W., 51
 Bin, Yu, 179
 Bingaman, B., 101
 Birur, Gaj, 72
 Bishop, Christopher J., 187
 Biswas, Rupak, 173, 224
 Blackman, Kathie, 21, 35
 Blackmore, Perry A., 61
 Blair, Bill, 178
 Blair, J., 66
 Blanchard, Laurie A., 161
 Blanken, Christopher, 159
 Bles, W., 11
 Block, Steven, 191
 Boden, A. F., 78
 Boer, L. C., 163
 Boers, M. N., 53
 Bogdanoff, David W., 73, 208

Bojkov, B. R., 100
 Boot, E. W., 158
 Booth, Christine, 164
 Boozer, Allen H., 239
 Borca, C. N., 213
 Borghese, F., 45
 Borgstahl, Gloria E. O., 54
 Born, George H., 20
 Borthomieu, Y., 64, 92
 Borucki, W. J., 244
 Borucki, William, 191, 231
 Bosanac, S. D., 227
 Bosart, Lance F., 111
 Bose, Deepak, 206
 Bossie, Paul C., 43
 Bostelman, R., 179
 Bouchard, Kathy, 46
 Bouttier, F., 124
 Boyer, Keith M., 70
 Braathen, G. O., 100
 Bradley, P. A., 241
 Brage, A., 127
 Bragg, Bobby, 94
 Bragg, Bobby J., 94
 Brambora, Clifford, 172
 Brannon, R. M., 83
 Brass, J. A., 175
 Brathwaite, Kevin, 101
 Braun, Barry, 156
 Breeding, S., 55, 56
 Bretar, Frederic, 32
 Brewer, J. C., 91
 Brickner, Michael S., 77
 Brill, Jack, 93
 Bromley, B. C., 241
 Browell, E. V., 100
 Brown, A. C., 86
 Brown, Robin L., 218
 Brown, Willie, 216
 Bruce, Gregg C., 66
 Buckley, Steve, 15
 Budai, J. D., 39
 Buhlmann, Peter, 179
 Bui, T. P., 122
 Buishand, T. A., 124
 Buishand, T. Adri, 119, 121
 Bula, Raymond J., 55
 Bunch, R., 179
 Burgan, R., 101
 Burge, Jim, 203
 Burken, John J., 7
 Burks, Geoffrey, 177
 Burley, R., 20
 Burner, Alpheus W., 2
 Burris, J., 100

Busby, Michael R., 177
 Butcher, Ginger, 135
 Butler, Dan, 70
 Byrd, F. D., 86
 Byrd, W. E., 52

C

Cai, Qing, 140
 Caiazzo, Anthony A., 41
 Caldwell, Douglas, 231
 Caldwell, J. M., 161
 Cambon, Gerard, 54
 Campbell, Art, 25
 Campbell, William J., 178
 Candler, Graham V., 37
 Canfield, D. V., 4
 Cannon, Tiffani, 177
 Cardinali, C., 124
 Carpenter, Bernie, 36
 Carpenter, J. Russell, 17
 Carpenter, Kenneth G., 202
 Carr, Jim, 31
 Carraway, Kermit, 139
 Carson, Donald E., 24
 Carswell, B., 55, 56
 Cernicharo, Jose, 238
 Chackerian, Charles, Jr., 110
 Challa, M., 20
 Chambers, C., 101
 Chan, Ken, 16
 Chan, Pui-King, 125
 Chance, Kelly V., 112
 Chang-Diaz, Franklin R., 162
 Chao, Winston C., 128
 Chaturvedi, A. K., 4
 Chavan, Anand, 67
 Cheatham, Sally A., 185
 Chen, Baode, 128
 Chen, J., 34
 Chen, L., 207
 Chen, Mei, 198
 Chen, S., 101
 Chilenski, J. J., 6
 Chin, Chao-wen, 235
 Chin, Shiu-Kai, 67
 Chinn, D. S., 246
 Chinn, Douglas S., 19
 Cho, KyeongJae, 209
 Choi, J., 213
 Choi, S. W., 40
 Chokani, Ndaona, 2
 Chou, Ming-Dah, 125
 Christl, M. J., 250

Chu, Don, 31, 33
 Chyba, Thomas, 108
 Ciszkowska, M., 44
 Clark, G., 7, 48
 Clark, Greg, 41
 Clark, Jonathan B., 149
 Clauw, Daniel, 152
 Cline, Todd, 203
 Clothiaux, E. E., 122
 Coad, Ross, 164
 Cockeram, B. V., 96
 Coe, M. J., 250
 Cohen, Aaron, 252
 Colavita, M. M., 78
 Colgan, Sean W., 231
 Conde, M. E., 201
 Connor, C., 21
 Content, David A., 204
 Conway, Sheila, 5
 Cooley, Steven, 16
 Cooney, T. W., 85
 Cooper, D., 113
 Coriell, Sam, 54
 Costa, Antonio F., 188
 Cotera, A. S., 231
 Cotting, M. Christopher, 7
 Cowell, S. A., 148
 Cowles, Phil, 94
 Cowles, Philip, 96
 Cox, Stephen K., 78
 Cox, I., 72
 Craig, Mark, 252
 Craig, Mark K., 252
 Craig, R., 102, 118
 Craig, R. D., 101
 Crassidis, John L., 17
 Creamer, Glenn, 31
 Cripe, Douglas G., 120
 Croft, Haiyan, 65
 Crompt, Robert F., 178
 Crouch, M., 55, 56
 Cucinotta, F. A., 40
 Cuenya, B. R., 212
 Culpepper, Randy, 135
 Currie, James, 65
 Curzan, J. P., 74
 Cushman, John H., 182
 Cutlip, William, 23
 Cutlip, William E., 24

D

Daelemans, Gerard J., 14
 Dalgarno, Alex, 240

Dally, William, 191
 Daly, C., 118
 Danese, Daniele, 143, 144
 Danilin, M. Y., 115
 Davey, Gordon, 72
 David, Jerry, 92
 Davidson, R. C., 207
 Davidson, Ronald A., 143
 Davies, Mike, 172, 174
 Davis, Jeffrey R., 150
 Davis, Melton, 225
 Dawson, D. M., 180
 Deetman, Gregg A., 6
 DeFiore, Thomas, 2
 deGroh, Henry C., III, 54
 DeGroot, David W., 161
 DeGruson, James, 93, 96
 deHaan, S., 124
 deJager, Cornelis, 242
 deKok, H. J., 163
 DelGenio, Anthony D., 126
 DeLuccia, Frank, 74
 Dermott, Jack, 93
 DesMarais, David J., 129, 130
 Deutschmann, Julie, 76
 deVahlDavis, Graham, 54
 DeVincenzi, Donald L., 235
 DeVito, Daniel S., 14
 Diaz, Philip, 225
 DiBenedetto, Maria D., 182
 Diemel, R. V., 156
 Dimitrijevic, N. M., 42
 Ding, H., 52
 Ding, R. Jeffrey, 81, 179
 Diskin, Boris, 168
 Dixon, W. E., 180
 Dodge, James C., 14
 Dodin, I. Y., 190
 Doelling, D. R., 100
 Doireau, Philippe, 146
 Doireau, Phillipe, 144, 145
 Doortmont, D. F., 112
 Doran, Peter T., 109
 Dorris, S. E., 53
 Doslic, N., 227
 Doty, Steven B., 134
 Doug, Xiquan, 123
 Dougal, Roger A., 65
 Douglass, Anne R., 108
 Drdla, Katja, 111
 Drewes, P. A., 85
 Drumheller, David M., 194
 Du, Ju-Young, 17
 Du, Xianglin, 136
 Dubovik, O., 106

Duenas, Ely, 232
 Duffield, Bruce, 160
 Duke, Michael B., 252
 Dunham, E., 191
 Dunham, Edward, 231
 Dunker, S. Chris, 27
 Dunn, C., 36
 Dunn, John M., 172, 174

E

Ebisuzaki, Wesley, 120
 Ebrahimi, Houshang B., 82
 Eckstein, W., 50
 Ediger, Mark, 142, 146, 147
 Edmond, L., 84
 Edwards, John W., 2
 Efroymson, R. A., 102
 Egan, M., 35
 Egbert, stephen D., 105
 Ehrlich, Jennifer A., 160
 Eichinger, W., 113
 Eidem, Ellen Johanne, 71
 Eiken, O., 162
 Eldridge, J. M., 60
 Eleftheriou, E., 47
 Eliopoulos, Themis, 146
 Elkin, G. R., 11
 Ellisor, S. W., 85
 Ely, Jay J., 69
 Emmitt, G. D., 125
 Epstein, Benjamin, 184
 Erlich, David C., 9
 Espinoza, Elizabeth Silvestre, 122
 Estes, Daniel R., 63
 Evans, D. G., 148
 Evans, J., 179
 Evenson, K. M., 112
 Evers, Laeslo, 194
 Ezhilchelvan, P., 167

F

Fabre, M., 64
 Falconer, D. A., 248
 Fang, H., 52
 Fang, Hou-Fei, 83
 Farmer, J., 55, 56
 Farsund, Bodil Hvesser, 60
 Feddema, J. T., 179
 Feenstra, R., 213
 Feldman, L. C., 210
 Fender, R. P., 250
 Ferrer, Charles P., 47

Ferry, G. V., 122
 Fey, R. H. B., 183
 Fibich, G., 181
 Fidalgo, Cynthia, 119
 Fiedler, Edna, 139, 152
 Files, Bill, 26
 Filman, Robert E., 173
 Finckenor, Miria, 28
 Finger, Mark H., 250
 Finholt, Thomas A., 169
 Finn, Cory, 160
 Fisch, N. J., 190
 Fleming, Eric L., 104
 Fletcher, C. L., 74
 Fletcher, L., 138
 Foelsche, R. O., 9
 Folta, David, 16, 19
 Fonnesbeck, J. E., 46
 Fontanella, J. J., 49
 Fork, Richard L., 68
 Forsythe, Elizabeth L., 197
 Fountain, W. F., 250
 Fowlkes, J. D., 39
 Fox, Cynthia, 164
 Frank, D., 84
 Frank, Jeremy, 15
 Frazer, G. J., 60, 61
 Freedman, Richard S., 110, 245
 Frerker, Rick, 94
 Fried, Barry, 233
 Friedel, M. J., 85
 Friedlander, Anne, 156
 Froeschl, Heinz, 109
 Froidevaux, L., 115
 Fthenakis, V., 97
 Fu, C. Y., 196
 Fu, G. Y., 205
 Fuelberg, Henry E., 116
 Fujii, K., 1
 Fujioka, F., 101
 Fulco, Charles S., 156
 Funayama, D., 101
 Fung, Cyra K., 148
 Funsten, H. O., 191

G

Gabrisch, Carsten, 172, 174
 Gabrys, Robert E., 221
 Gai, W., 200, 201
 Gai, Yu-Qing, 154
 Gale, Alan, 169
 Gallagher, D. L., 110
 Gallagher, Robert M., 235

Galland, Pierre A., 217
 Ganguli, Supriya B., 126
 Gao, B.-C., 62
 Gao, Bo-Cai, 125
 Garber, M., 4
 Garcia, Fred E., II, 181
 Garrick, Joseph, 34
 Garrington, S. T., 250
 Gavrishchaka, Valeriy V., 126
 Geiger, H., 215
 Gelman, Melvyn E., 120
 Gettleman, Alan, 223
 Ghaffarian, Benny, 33
 Ghuman, Parminder, 172
 Gibbs, Stephen T., 12
 Gido, Samuel P., 50
 Gil, Joan, 216
 Gilbaugh, Bruce, 60
 Gilinsky, Mikhail, 57
 Gillies, Donald C., 55
 Gilsinn, D. E., 166
 Gin, A. E., 74
 Giver, Lawrence P., 110
 Glagola, B., 201
 Glass, Brian, 60
 Globus, Ruth K., 134
 Goetz, Alexander F. H., 90, 125
 Gogolowski, Raymond P., 190
 Gogus, E., 250
 Gokey, Christopher D., 227
 Gold, Kenn L., 20
 Goldsmith, Theodore C., 14
 Gomes, I. C., 200
 Goodsell, Aga M., 130
 Gorelenkov, N. N., 207
 Gornakov, V. S., 210
 Gourbat, Jean Pierre, 144, 145
 Goutail, F., 100
 Gouzman, Irina, 242
 Govidan, T. R., 209
 Govindam, T. R., 206
 Govindan, T. R., 69
 Graf, Hans-F., 108
 Gramling, Cheryl, 17
 Granatstein, Victor L., 64
 Grasso, Robert J., 80
 Graves, Sharon S., 2
 Gray, E. M., 224
 Gray, G. W., 142
 Gray, Gary W., 146
 Gray, K. E., 213
 Grebogi, Celso, 73
 Green, Bradford S., 114
 Green, J. Philip, 61, 62
 Green, James L., 219

Greenleaf, J. E., 148
 Gregory, J. C., 250
 Griffin, R., 47
 Griffis, A. J., 77
 Grimsditch, M., 204
 Groenkvist, M., 162
 Gross, K. J., 97
 Grossman, Eitan, 242
 Gu, Hua-Guang, 164
 Guan, Jian-Cheng, 153
 Guedes, I., 204
 Guimaraes, F. B., 196
 Gulbransen, D. J., 74
 Gundersen, Gary G., 182
 Guo, Shuang-Sheng, 165
 Gursel, Y., 78
 Guruswamy, Guru P., 172
 Gustafsson, K. K., 198
 Guzman, Jose J., 16

H

Haak, Hein, 194
 Haberle, Robert M., 116, 243
 Haile, Tesfa, 59
 Hakkinen, Sirpa, 106
 Halem, Milton, 216
 Hallett, J., 122
 Hamilton, Andrew D., 138
 Hamilton, H. Harris, 12
 Hamilton, Nicholas, 18
 Hammer, A. H., 156
 Han, Dong-Xu, 155
 Han, H. T., 40
 Han, Haewook, 202
 Han, J., 101
 Han, Li-Jun, 51
 Han, Qing-Yuan, 117
 Hao, Wei-Ya, 153
 Harding, Ian, 233
 Harding, Thomas H., 79
 Harman, R., 20
 Harman, Richard, 75
 Harman, Richard R., 33, 76
 Harman, William H., 184
 Harrington, James L., Jr., 215, 216
 Harrington, James, Jr., 195, 218
 Harris, Joe, 31
 Harris, W. C., 101, 225
 Harter, Peter, 33
 Harvey, John A., 140
 Hashmall, J., 34
 Hassanein, A., 200
 Hastings, J., 200
 Hathaway, D. H., 248
 Hauser, Jim, 79
 Haveman, J., 166
 Hawkins, Albin, 19
 Haworth, Loran, 159
 He, D., 105
 Hedenmalm, Hakan, 188
 Hedgley, David R., Jr., 174
 Heidbrink, W. W., 207
 Heilmann, Ralf K., 204
 Helm, C., 215
 Helsdingen, A. S., 159
 Henegar, Joy, 14
 Henriksen, G. L., 96
 Henry, Jean W., 45
 Herpin, Fabrice, 238
 Hesselgesser, Connie, 150
 Hidalgo, Ruben A., 188
 Higgins, Paul J., 141
 Hinklely, M. K., 61
 Hines, B. E., 78
 Hino, Tomoaki, 47
 Hirschman, S., 207
 Hix, W. R., 240
 Hjelle, B., 137
 Ho, P. P., 217
 Hoad, Danny R., 192
 Hoehler, Tori M., 99, 129, 130
 Hoge, Susan, 19
 Holben, B. N., 106
 Holewijn, M., 151
 Holland, O. W., 211
 Holleman, Iwan, 127
 Hollenbach, D. F., 200
 Hollenbach, D. J., 231
 Hollenbach, David, 235, 236
 Hollenbach, David J., 232
 Hollenbeck, J. L., 96
 Holley, D. C., 134
 Holloway, C. L., 190
 Holloway, Jim, 170
 Home, A., 20
 Homer, M. H., 41
 Hope, W. W., 101
 Hopkins, Dale A., 82
 Hoppel, K. W., 115
 Horita, Eisuke, 58
 Horton, Kirk G., 89
 Horvath, Thomas J., 12
 Hosman, R. J. A. W., 11
 Hossain, S., 95
 Hou, Arthur Y., 118
 Howard, Regan E., 25
 Howell, Kathleen C., 16
 Hsu, David S., 68

Hsu, Fu-Lian, 43
 Hu, Y. X., 62
 Huang, H.-L., 62
 Huang, Yan, 46
 Huang, Zeng-Xin, 198
 Hubert, Carl, 21
 Hudgins, Douglas M., 244
 Hudson, S., 207
 Huff, Edward M., 81
 Hughes, Declan, 17
 Hughes, Steven P., 18
 Humenn, Polar, 175
 Hunt, Kelly, 137
 Hunt, Teresa, 21, 35
 Huppi, E. R., 35
 Hurley, K., 250
 Huybrechts, Steven, 30
 Hyde, W. K., 99
 Hyland, Bob, 91

I

Idris, Nebila, 139
 Iguchi, Martin Y., 140
 IJspeert, J., 151
 Ilan, B., 181
 Ilic, B., 204
 Indacochea, J. E., 51
 Ingram, W. J., 59, 224
 Inkelas, Moira, 137
 Inomata, A., 211
 Inoue, G., 104
 Inoue, Y., 1
 Isaacson, Mark J., 65
 Iwaniec, H., 183

J

Jackman, Charles H., 104
 Jacob, Daniel J., 111
 Janev, R. K., 207
 Jardin, S. C., 206
 Jasnow, David, 50
 Jawerth, Bjorn, 187
 Jayaraman, N., 41
 Jeevarajan, Judith, 94
 Jenkins, J., 191
 Jenkins, Jon, 231
 Jennings, J. W., 86
 Jennings, R. D., 59
 Jesse, S., 39
 Ji, Gui-Ying, 140
 Ji, H., 206
 Jia, Hong-Bo, 154

Jiang, Guo-Hua, 165
 Jiang, J. S., 210, 211
 Jiang, Jian-Dong, 140
 Jiang, Shi-Zhong, 152, 153
 Jiang, Yi-Cheng, 188
 Job, P. K., 199
 Johnson, Christine C., 136
 Johnson, Kevin, 65
 Johnson, L. P., 101, 118
 Johnson, Philip, 92, 95
 Johnson, W. R., 41
 Jonah, C. D., 42
 Jones, Carmen B., 37
 Jones, Harry, 160
 Jonsson, Ari, 15
 Joosen, M. J. A., 156
 Jorgensen, Charles, 167
 Josypenko, Michael J., 67
 Jubert, M., 179
 Jularbul, Audrey, 237
 Junkins, John L., 17
 Justus, A., 199, 201

K

Kaganovich, I. D., 207
 Kallunki, Sari, 189
 Kambis, Kenneth, 156
 Kanarek, I. A., 53
 Kanareyken, A., 201
 Kanareykin, A., 200
 Kang, Jin U., 202
 Kanno, K., 93
 Kao, David, 73
 Kao, J., 113
 Katiyar, Ram S., 88
 Kato, S., 122
 Kaufman, Y. J., 106
 Kaul, Dean C., 105
 Kawa, Stephan R., 108
 Kawamura, Jonathan, 238
 Kayumov, I. R., 188
 Kealy, Peter S. M., 74
 Keene, Jocelyn, 239
 Keith, Reginald, 193
 Keith, Theo G., Jr., 71
 Kelbel, David, 17
 Keller, Richard M., 224
 Kelly, Bruce, 149
 Kelly, Chad, 93, 96
 Kelly, Michael, 14
 Kendig, David, 227
 Kennelly, Robert A., Jr., 130
 Keski-Kuha, Ritva A., 204

Kessel, C., 205
 Keys, Andrew S., 68
 Keys, Denney, 91
 Keyser, Herbert L., 112
 Khaiyer, M. M., 100
 Khounsary, A., 57
 Khurgin, Jacob B., 202
 Kim, D. H., 213
 Kim, Do-Hyun, 202
 Kim, Kyu-Myong, 120
 Kim, M. H., 40
 Kimble, H. J., 198
 Kiris, Cetin, 23
 Kissick, W. A., 59
 Kitts, Christopher, 51
 Klasen, M., 196, 197, 201
 Kleen, Laura J., 178
 Kleespies, Thomas J., 61, 62
 Klepaczko, J. R., 48
 Kletzing, C. A., 110
 Klimov, Anatoly, 206
 Knight, Norman F., Jr., 58
 Ko, Malcolm K. W., 115
 Koch, D., 191
 Koch, David, 231
 Koeberl, Christian, 109
 Koelegaerd, R., 162
 Koerner, Wilfried, 109
 Kok, C. J., 122
 Konecny, R., 201
 Kooi, Jacob, 238
 Koosis, Paul, 182
 Koppen, Sandra V., 69
 Koritala, R. E., 209
 Kosofsky, Barry E., 140
 Kouveliotou, C., 250
 Koyanagi, Kojiro, 202
 Krasnicki, F., 57
 Ku, Jentung, 72
 Ku, L., 207
 Ku, L. P., 205
 Kubitschek, Daniel G., 20
 Kuhn, Jonathan, 234
 Kulrud, R. M., 206
 Kung, Mou-Liang, 177
 Kunt, Cengiz, 204
 Kurdyla, 89
 Kurotaki, T., 1
 Kusawake, H., 93
 Kuwajima, S., 93
 Kwak, Dochan, 23, 72

L

LaBel, Kenneth, 229
 Labow, Gordon J., 104
 Laenen, E., 195, 214
 Laflamme, R., 241
 Laforte, Jean-Louis, 46
 Lagarde, D., 148
 Lagus, K., 223
 Lait, L. R., 100
 Lallement, G., 148
 Lam, Barry, 146
 Lam, Berry, 145
 Lammi, Eric, 156
 Landphair, H. C., 86
 Langley, Pat, 226
 Lau, William K. M., 120
 Laubach, S. E., 86
 Laue, Jay, 36
 Lawless, Kirby, 80
 Laycock, Silas, 250
 Lee, Diana D., 173
 Lee, Kee-Joo, 41
 Lee, S., 21
 Lee, T. H., 53
 Lee, Taesul, 17
 Leet, Sung W., 41
 Lehman, B., 103
 Leij, F. J., 171
 Leising, Randolph A., 66
 LeMoigne, Jacqueline, 178
 Lemoine, Frank G., 19, 246
 Lenihan, J. M., 118
 Lennartsson, R. F., 68
 Leonardi, E., 54
 Leshin, Laurie A., 241
 Lesht, B. M., 122
 Levine, J., 169
 Levine, R. P., 140
 Levy, Mireille F., 184
 Lew, Henry, 194
 Lewis, Harlan L., 64
 Lewis, Nathan, 191
 Li, D., 212
 Li, De-Yu, 153
 Li, H., 47
 Li, Jian-Dong, 139
 Li, Shun-Lu, 46
 Li, Tan-Qiu, 51
 Li, Wen-Zhe, 81
 Li, X., 205
 Liang, X., 217
 Liberman, Louisa, 89
 Lifshitz, Yeshayahu, 242
 Liljegren, J. C., 122

Lillo, R. S., 161
 Lin, Z., 207
 Lindborg, B., 162
 Lindqvist, P., 127
 Ling, C. D., 211
 Linker, Jon A., 249
 Lippert, Espen, 79
 Lis, D. C., 239
 Lissauer, Jack J., 237
 Liu, Bing-Kun, 152
 Liu, Hong-Jin, 140
 Liu, X., 93
 Liu, Xiang-Yang, 46
 Liu, Y., 23
 Liu, Yu-Sheng, 155
 Liu, Yue-Hong, 155
 Liu, Zheng, 154
 Livingston, J. M., 103
 Lizius, David, 94
 Loader, C., 7
 Lobel, Alex, 242
 Lobitz, Brad, 247
 Locke, Laura, 95
 Lombardi, M. A., 169
 London, K. W., 71
 Long, Anne, 17
 Los, M., 151
 Lou, M., 52
 Lou, Michael, 83
 Lougear, Andre, 109
 Loutfy, R., 95
 Lovelace, Jeff, 54
 Lowndes, D. H., 39
 Lu, Jiang-Yang, 155
 Lu, Xi-Yu, 46
 Lu, Zhi-Zhong, 139
 Lucia, F. J., 84, 86
 Lupton, William, 176
 Luquette, Richard J., 30
 Lurie, Chuck, 92, 95
 Luthcke, Scott B., 19
 Luthin, J., 50
 Ly, William, 35
 Lyapustin, Alexei I., 74
 Lyjak, L. V., 115
 Lynch, John P., 15
 Lynnes, Christopher, 87
 Lyons, John, 36
 Lyons, R., 137

M

Ma, C., 44
 Ma, Jun, 108

MacDonald, Jay, 156
 Mace, Gerald G., 123
 MacElroy, Robert D., 247
 Machida, T., 104
 Mack, Robert, 87
 Maeki, E., 221
 Mah, Robert W., 141
 Mahaffy, P., 247
 Mailhe, Laurie M., 18
 Makin, V. K., 112
 Makkus, J. C., 53
 Malay, Benjamin P., 230
 Malbet, F., 78
 Malone, John, 219
 Maloney, P. R., 231
 Malouvier, Alexander, 134
 Maloy, S. A., 41
 Mangalam, Siva M., 2
 Manney, Gloria L., 120
 Manning, Carol A., 164
 Marcoux, Lynn, 66
 Marcus, Martin H., 174
 Margolis, S. B., 42
 Markley, F. Landis, 76
 Markley, L., 21
 Marochnik, Leonid, 233
 Marr, Gregory, 19
 Marseille, G. J., 124
 Marsh, R., 95
 Martens, Christopher S., 129
 Martens, K. U., 250
 Martin, Chris, 30
 Martin, Franklin D., 252
 Martin, John S., 79
 Martin, L. E., 137
 Maskit, Bernard, 187
 Mathews, Michael, 16
 Matthew, William T., 236
 Matthews, Elaine, 87
 Matthews, Karyn, 172, 174
 Mael, Michael E., 239
 Mazzuca, Lisa, 234
 McCann, Karen M., 170, 173, 224
 McCarter, D., 57
 McClain, D. L., 86
 McComas, D. J., 191
 McCord, C., 101
 McCormick, M. Patrick, 103
 McCue, Justin T., 38
 McCurdy, Howard E., 251, 252
 McCutcheon, Robert, 233
 McDeavitt, S. M., 51
 McDonald, Eleanor, 80
 McFalls, J. A., 86
 McGee, T., 100

McGee, T. J., 107
 McGhee, J. M., 173
 McGiffin, Daniel A., 16
 McKay, Chris, 246
 McKay, Christopher P., 243, 247
 McKee, C., 236
 McKenna, P. M., 190
 McKnight, M. E., 52
 McLennan, Scott M., 115
 McMahan, W. E., 47
 McNamara, Ed, 29
 McPeters, Richard D., 104
 Mebane, Lloyd, 101
 Medvedev, Valentin K., 44
 Meek, Matthew C., 20
 Meeson, Blanche W., 221
 Mehra, Pankaj, 176
 Mehta, Unmeel B., 208
 Melendez, F., 85
 Meltzer, David O., 128
 Mendenhall, J. A., 90
 Meneghesso, Gaudenzio, 226
 Menon, Madhu, 209
 Merkle, Charles L., 82
 Metlushko, V., 204
 Meyers, David, 177
 Meyers, Karen, 160
 Meyers, S., 103
 Meyyappan, M., 206
 Mezzacappa, A., 240
 Michel, P., 183
 Micklos, Richard, 2
 Mihalov, John D., 116
 Milburn, J. E., 211
 Miles, Robert W., 22
 Miller, D. J., 212, 213
 Miller, J., 40
 Mills, Scott H., 164
 Mills, T., 7
 Mills, William, 139, 152
 Milokov, S., 72
 Minnis, P., 100
 Minnis, Patrick, 123
 Miracle-Sole, S., 50, 210
 Mishchenko, M. I., 62
 Mishima, Teruhito, 180, 202
 Mishra, C. S., 199
 Mitchell, J. F., 211, 212
 Miyamoto, Noboru, 81
 Miyanaaga, Yoshikazu, 58
 Mo, Tsan, 61, 62
 Moeller, K. A., 134
 Mogilka, Henry J., 164
 Mohanraj, Rajendran, 82
 Mondoloni, Stephane, 5

Montanez, P., 200
 Montgomery, Ron W., 4
 Monticello, D., 207
 Monticello, D. A., 205
 Moore, Brandy, 65
 Moore, Brian, 237
 Moore, Gary, 189
 Moore, Gregory, 205
 Moore, R. L., 248
 Moran, Megan M., 148
 Morel, J. E., 173
 Morey-Holton, Emily, 134
 Morgan, Bruce R., 190
 Morgenstern, Wendy, 34
 Morgenstern, Wendy M., 170
 Morgenthaler, J. P., 245
 Morris, C. L., 196
 Morris, Edward, Jr., 26
 Morris, Robert, 15
 Moser, Amy, 133
 Mosier, Gary E., 234
 Mostefaoui, A., 167
 Mott, Brent, 234
 Mott, David R., 186
 Moy, E., 21
 Mozer, F. S., 110
 Mrozinski, Richard B., 14
 Murbach, Marcus, 162
 Murphy, James R., 116
 Murphy, Robert E., 14, 74
 Murphy, T., 199
 Murthy, Sreedhara V., 10
 Muza, Stephen R., 156
 Myers, Robert J., 220
 Myslinski, M., 21

N

Naghedolfeizi, Masoud, 171
 Nakagawara, Van B., 4
 Nasr, Chaiban, 180
 Naujokat, Barbara, 120
 Neff, Susan G., 202
 Neilson, R. P., 118
 Nelson, L. M., 169
 Nelson, Michael L., 227
 Nelson, P. A., 96
 Nelson, Thomas R., 68
 Nemeth, S., 102
 Nessett, Dan, 175
 Neumann, G. A., 246
 Newman, P. A., 100
 Newton, Jason, 109
 Ng, Ray, 33

Nguyen, L., 100
 Nguyen, Truong X., 69
 Ni, Cheng-Zhi, 155
 Nicholson, Anthony N., 143, 144
 Nieuwenhuijzen, Hans, 242
 Nikitenko, V. I., 210
 Nolen, J. A., 200
 Nolt, I. G., 112
 Nordeen, M. L., 100
 Noter, Yoram, 242
 Nycander, J., 128

O

Obermair, G., 215
 Obl, W., 101
 OConnor, Cornelius J., 5
 ODonnell, James R., Jr., 31, 170
 Oettinger, Ayelet, 77
 Ohno-Machado, Lucila, 131
 Ojima, D. S., 118
 Okamoto, Atsushi, 180
 Okoh, Fred, 216
 Oland, C. B., 56
 Oliverson, Ron J., 245
 Olsen, Lola, 227
 Olson, J. M., 47
 Oostdijk, J. P., 156
 Oran, Elaine S., 185, 186
 Orme, Daniel R., 139, 152
 Ottenstein, N., 20
 Overton, K., 84
 Owen, Brown, 74

P

Padgett, David, 217
 Palazzo, Marcus J., 66
 Palmer, D. L., 78
 Pan, X. P., 78
 Pang, Alex, 73
 Pardo, Juan R., 238
 Pareti, Paul, 80
 Paris, Jean-Francois, 144, 145
 Park, Chul, 73, 208
 Park, K., 112
 Park, W., 206
 Parravano, A., 236
 Partridge, Harry, 197
 Parvez, Shabbir A., 17
 Patel, S. K., 250
 Patel, Umesh D., 172
 Patnaik, Surya N., 82
 Patt, Frederick S., 22

Patterson, John C., 139, 152
 Pauls, Thomas A., 202
 Pautz, S. D., 173
 Pavco, John A., 59
 Pavlis, D. E., 246
 Pavlis, Despina E., 19
 Pawson, Steven, 120
 Paynter, S., 166
 Peale, S. J., 245
 Pearson, J., 212
 Pearson, J. E., 211
 Peck, Mason A., 28
 Pedraza, A. J., 39
 Pei, Jing-Chen, 164
 Peres, M., 148
 Perez, Graciela M., 163
 Perlwitz, Judith, 108
 Peteet, Dorothy, 88, 89
 Peterson, J. L., 87
 Pfleiderer, Elaine, 164
 Pham, Long, 87
 Phifer, Mabel, 216
 Phifer-McGee, Kimberly, 216
 Phillips, T. G., 239
 Phillips, Thomas G., 238
 Pickard, Jeb S., 142, 143, 146, 147
 Pierard, C., 148
 Pines, Darryll J., 18
 Pinkus, Alan R., 8
 Planchat, J. P., 92
 Platnick, S., 62
 Podolski, Igor, 55
 Pohjola, T., 214
 Pohorille, Andrew, 43, 165
 Pollack, Janine, 227
 Pontius, Jim, 33
 Porter, J. G., 248
 Porter, W. R., 161
 Potsdam, Mark, 172
 Power, J. G., 200, 201
 Praderas, Cid J., 104
 Pratas, C., 53
 Pratty, Adam C., 80
 Price, C., 84
 Price, Jennifer L., 2
 Prigent, Catherine, 87
 Privette, Jeffrey, 74
 Pryor, R. J., 179
 Pueschel, Rudolf F., 113, 122
 Pugh, Brett, 33
 Pusey, Marc L., 197
 Puts, Rob, 102

Q

Qi-Zhang-Nian, 198
 Qiao, Jian-Yong, 189
 Qiao, Zong-Lin, 153
 Qu, Xiang-Ju, 153
 Quinn, David A., 6
 Quinn, Richard C., 246
 Quinzio, M. V., 92

R

Radomski, M. S., 75
 Rai, Amarendra K., 52
 Raja, R., 199
 Randall, David A., 120
 Ransom, Jonathan B., 57
 Rao, Gopalakrishna, 93
 Rao, Gopalakrishna M., 66, 91, 92
 Raposa, John R., 67
 Rapp, A. D., 100
 Rash, Clarence E., 79
 Ratkowski, A. J., 35
 Ratnakumar, B. V., 95
 Rauchas, A., 199, 201
 Raynal, M., 167
 Readhead, Mark L., 78, 193
 Redemann, J., 103
 Redemann, Jens, 103
 Redi, M. H., 205
 Redman, B. C., 77
 Reed, C. B., 200
 Regan, Larry J., 223
 Regeon, Paul, 13
 Rehm, Raymond, 94
 Reichardt, J., 107
 Reichardt, S., 107
 Reiman, A., 207
 Reise, Christa M., 192
 Reisner, J., 113
 Remer, L. A., 106
 Ren, Wei, 154
 Renik, Byrdie, 88
 Retherford, K. D., 245
 Reynolds, Alfred, 178
 Reynolds, Barbara S., 79
 Reynolds, R. G., 76
 Reynolds, Reid, 31
 Ricca, Alessandra, 38, 43
 Richard, E., 100
 Richard, E. C., 115
 Richardson, Guy, 26
 Richie, David J., 10
 Riemersma, J. B. J., 158
 Rienstra, J. L., 61
 Riha, B. D., 99
 Ritter, Jim, 25
 Roads, John, 101
 Roberson, Sheri, 149
 Robertson, L., 213
 Robinson, Scott, 156
 Rock, Paul B., 156
 Rodriguez, David, 172
 Rodriguez, Waldo J., 220
 Roedig, Erich, 146
 Rogers, R. C., 9
 Rohrbaugh, Dennis K., 43
 Romine, Peter L., 179
 Rose, F., 55, 56
 Rose, W. H., 102
 Rosenfield, Joan, 111
 Roser, T., 199
 Ross, Adam, 16
 Rossabi, J., 99
 Rossiter, W. J., 52
 Rossow, William B., 87, 117
 Roth, J., 50
 Rothenberger, K. S., 53
 Rothfuss, Christopher J., 44
 Rovinsky, M., 166
 Rowlands, David, 104
 Rowlands, David D., 19, 246
 Ruppel, S. C., 84
 Rus, Daniela, 225
 Russell, James M., 104
 Russell, Philip B., 103
 Rustad, Gunnar, 79
 Rutherford, R. W., 41
 Rutishauser, David K., 5

S

Sabutis, Joseph L., 120
 Sager, Jennifer A., 6
 Sahm, P. R., 209
 Salama, Farid, 231, 240, 242
 Salama, K., 210
 Salby, Murry L., 114
 Saleh, Y., 95
 Salmon, J., 241
 Sampson, A. W., 87
 Sanchez, Braulio V., 104
 Sanders, F. H., 190
 Sandford, Scott A., 236
 Sandrock, G., 97
 Sangiovanni-Vincentelli, Alberto, 182
 Sanneman, Paul, 21, 35
 Sanneman, Paul A., 6
 Sanner, Robert M., 30, 76

Santee, M. L., 115
 Santee, Michelle L., 120
 Santee, William R., 236
 Santiago, S. S., 222
 Sarukkai, Sekhar R., 176
 Sathaye, J., 103
 Sayal, Chetan, 33
 Schaafstal, A. M., 158
 Schachner, Christian, 171
 Schafer, Joseph H., 226
 Schatten, Kenneth, 248
 Scheiman, James, 192
 Scherb, F., 245
 Schibley, E. B., 77
 Schilke, P., 239
 Schmid, B., 103
 Schmid, K., 50
 Schmidt, R., 8
 Schneider, J. D., 191
 Schneider, Stanley, 14
 Schoeberl, M. R., 100
 Schoeberl, Mark, 111
 Schoeller, H., 214
 Schoen, G., 214
 Schofield, John T., 116
 Schraagen, J. M. C., 63
 Schrepel, Terry, 29
 Schrijver, Carolus J., 202
 Schueler, Carl F., 74
 Schultz, D. R., 207
 Schultz, Joseph R., 18
 Schumacher, K., 103
 Schumann, Johann, 168
 Schur, Willi W., 183
 Schuster, David M., 2
 Schwabacher, Mark, 226
 Schwartz, J., 209
 Scott, Rhonda B., 127
 Scuseria, Gustavo E., 195
 Searby, Nancy D., 134
 Sedlak, J., 34
 Seiff, Alvin, 116
 Seiner, John M., 57
 Sethuraman, Jayaram, 185
 Shanmugalingam, Nageswari, 189
 Shao, M., 78
 Shapiro, A. J., 210
 Shapiro, Alan P., 56
 Sharp, P. K., 7, 48
 Shaw, Harry, 202
 Sheffner, E. J., 175
 Shen, Li-Ping, 51
 Shen, S. P., 120
 Shen, Xing-Yun, 164
 Shepherd, J. Marshall, 126
 Shiao, M., 7
 Shiao, MiMichael, 40
 Shih, A. T., 9
 Shinn, J. L., 40
 Shirouzu, M., 1
 Shlesinger, M. F., 49
 Shockey, D. A., 9
 Shoemaker, Helen, 150
 Showen, Robert, 231
 Shu, Chi-Wang, 186
 Shukla, Pooja, 215
 Shull, R. D., 210
 Shulman, Seth, 21
 Shulman, Seth E., 6
 Shvets, G., 205, 207
 Siegel, B., 228
 Sierra, Albert, 26
 Signor, A., 52
 Sigray, P., 127
 Silverstein, Bernard, 151
 Simons, Jeffrey W., 9
 Simonsen, L. C., 40
 Simonson, S. R., 148
 Sims, Danny, 119
 Singer, Jack N., 157
 Singh, Hanwant B., 111
 Singleterry, R. C., 40
 Sipahutar, Halomoan, 175
 Skiles, J. W., 175
 Skotheim, Terje, 91
 Skovlin, J. M., 87
 Sluimer, R. R., 12
 Smart, M. C., 95
 Smith, D., 21
 Smith, D. L., 240
 Smith, D. R., 35
 Smith, Daniel M., Jr., 238
 Smith, David E., 15, 246
 Smith, Eric A., 119
 Smith, H. V., 191
 Smith, Janice K., 14
 Smith, Kevin D., 214
 Smith, M. S., 240
 Smith, W. L., Jr., 100
 Smith, Warren, 177
 Smith, Willard, 218
 Smyth, W. H., 245
 Smyth, William H., 246
 Snell, Edward H., 54
 Snyder, Robert S., 45
 Sokolsky, Pierre, 250
 Soleng, Harald H., 82, 172
 Solomon, Joshua A., 169
 Solomon, Joshua A., 169
 Sone, Y., 93
 Sonenshein, Gail E., 133
 Sostrand, Knut A., 71
 Sotoohi, Goli, 177
 Souza, K. A., 138
 Spackman, J. R., 115
 Speer, Dave, 21
 Speirs, N. A., 167
 Spillman, David M., 66
 Spurrett, R., 95
 Spurrett, Rob, 94, 96
 Sridhar, Bavavar, 3
 Srivastava, Anuj, 185
 Srivastava, Deepak, 208, 209, 213
 Stahl, H. Philip, 203
 Staniewicz, Bob, 65
 Staniewicz, Robert J., 92
 Starin, Scott R., 31
 Starrfield, S., 240
 Startsev, E., 207
 Steedman, R. S., 107
 Stein, T. Peter, 148
 Steinberg, Paul, 140
 Stenersen, Knut, 79
 Stepniewski, Slawomir, 167
 Sterman, G., 195, 214
 Stevens, D., 101
 Stewart, A., 101
 Stimson, Clinton G., 80
 Stocks, J. M., 148
 Stoeberg, K., 228
 Stoffelen, A., 124
 Stone, Barbara M., 143, 144
 Stothers, Richard, 242
 Stothers, Richard B., 235
 Stott, D. T., 167
 Strachan, Leonard, 229
 Strangways, Brad, 94
 Strawa, A. W., 122
 Strawn, Mike, 92
 Strickler, G. S., 87
 Strothers, Richard B., 99
 Strube, Randall, 133
 Stuhmiller, James H., 131, 132
 Stuhmiller, Louise M., 131, 132
 Stuve, Eric M., 44
 Suarez, Max, 106
 Sugar, 89
 Sugimoto, Yasuro, 129
 Sullivan, D. V., 175
 Sullivan, David, 91
 Sumida, John, 197
 Sun, Hong-Yi, 155
 Sun, Hua-Di, 154
 Sun, Xi-Qing, 153
 Sundstroem, A., 192

Suorsa, Raymond E., 3
 Surampudi, S., 95
 Sutijono, Darrell, 134
 Sutter, G. W., 102
 Svizhenko, Alexel, 69
 Swanson, Daniel, 21
 Swinbank, Richard, 120
 Szabo, S., 179
 Szoboszlay, Zoltan, 159

T

Tagashira, T., 104
 Tahmasebi, Farhad, 83
 Tait, T., 196
 Tait, T. M. P., 201
 Takahashi, K., 42
 Takeuchi, Esther S., 66
 Takeuchi, Kenneth J., 66
 Tamaru, T., 104
 Tamrazov, Promarz M., 187
 Tangedahl, M., 57
 Tanre, D., 106
 Tao, Wei-Kuo, 124
 Task, Harry L., 8
 Taylor, Raynor, 14
 Temkin, A., 196
 Temple, Enoch C., 218
 Tennant, A. F., 250
 Teofilo, Vincent L., 65
 Thaller, Lawrence H., 64
 Thibeault, S. A., 40
 Thivierge, Daniel P., 67
 Thomas, D. K., 211
 Thomas, G. J., 97
 Thomas, James L., 168
 Thomas, Pete, 24
 Thomas, Valerie, 218
 Thompson, Blair F., 20
 Thompson, D., 86
 Thompson, Jack, 80
 Thwaite, Carl, 94, 96
 Timlin, J. A., 137
 To, Gloria, 64
 Toba, Samuel, 138
 Tochinai, Koji, 58
 Todosow, M., 200
 Tomkiewicz, M., 44
 Tong, Li, 155
 Torbert, R. B., 110
 Toussaint, U. V., 50
 Trautwein, Alfred X., 109
 Trehwella, J., 135
 Trociewitz, U. P., 209

Tsai, C.-Y., 9
 Tsay, S.-C., 62
 Tsung, Fu-Lin, 71
 Tsynkov, S., 181
 Tufillaro, Nicholas, 233
 Tuli, J. K., 197
 Tulsee, Taran, 75
 Tumer, Irem Y., 81
 Turner, Claire, 144
 Twiggs, Robert J., 29
 Tyson, Jeremy T., 187

U

Updike, T., 191
 Usikov, Daniel, 233

V

Vacca, J., 199, 201
 Vahedi-Faridi, Ardeschir, 54
 Vaidyanathan, Hari, 66, 93
 Valentine, T. E., 198
 Van Genuchten, M. T., 171
 VanDalsem, William R., 228
 vandeKasstele, J., 90
 vandeMeent-vanderHorst, D., 156
 vandenBosch, K., 12, 159
 vanderA, Ronald, 105
 Vanderau, J. M., 59
 VanderWijngaart, Rob, 224
 VanderWijngaart, Rob F., 173
 vanEsch, J. H. M., 156
 Vangel, M. G., 52
 vanHelden, H. P. M., 156
 Vann, Christopher M., 80
 vanRooyen, M. P., 53
 vanVliet, W., 103
 Vanzl, Massimo, 226
 Varanasi, Prasad, 110
 Vasiljevic, D., 124
 Vatvicka, Vaclav, 193
 Vaughn, Frank J., Jr., 19
 Vavassori, P., 204
 Veldhuis, G. J., 158
 Veluri, V. R., 199, 201
 Verderame, Ken, 27
 Verkley, W. T. M., 116
 Vernacchio, A., 21
 Verolme, K., 49
 Vinals, Jorge, 70
 Visentine, Jim, 28
 Vogelsang, W., 195, 214
 Vollmer, Bruce, 87

Voss, Janice, 157

W

Wade, Charles E., 148
 Wade, Montanez, 177
 Wagner, George W., 43
 Waheed, Abdul, 177
 Wakim, Nagi, 216
 Walch, Stephen P., 43
 Walker, David M., 134
 Wallace, J. K., 78
 Wallenius, H., 221
 Wander, Joseph D., 12
 Wang, Gen-Liang, 198
 Wang, Kui-Nian, 154
 Wang, L., 217
 Wang, Lu-Ming, 139
 Wang, M., 105
 Wang, Tian-Fu, 153
 Wang, Tommy J., 148
 Wang, Xian-Min, 152
 Wang, Yu-Lan, 152
 Wang, Zhe, 140
 Wannemacher, Harry, 91
 Ward, Douglas T., 32
 Ward, Michael, 13
 Wareing, T. A., 173
 Warren, M. S., 241
 Watanabe, S., 1
 Watson, Andrew B., 169
 Waugh, Darryn W., 108
 Waxman, A., 228
 Webbon, Bruce, 55
 Webster, Larry, 231
 Wei, Hong, 153
 Wei, Jin-He, 154
 Weidner, John W., 65
 Weinstein, Steven L., 134
 Welch, Ronald, 117
 Welsch, Carol, 14, 74
 Wenzel, Suzanne L., 140
 Wercinski, Paul F., 244
 Werner, M. W., 239
 Wertheim, A. H., 163
 Wetzler, Peter J., 98
 Weydahl, Dan Johan, 32
 Wheeler, Kevin, 167
 Whisnant, K., 167
 Whitcanack, L., 95
 White, Nicholas E., 230
 White, Ralph E., 65
 White, Susan M., 43, 49
 White, V. L., 4

Whitely, Richard, 65
 Whitten, R. C., 244
 Wierba, Elizabeth E., 169
 Wilczynski, Peter, 14
 Wilkin, Paul, 33
 Williams, Ellen, 191
 Williams, Kevin W., 11
 Williamson, Lorenzo, 101
 Willingham, Erin C., 58
 Williston, Christopher A., 12
 Wilson, Colleen A., 250
 Wilson, J. W., 40
 Winebrake, J., 105
 Winget, C. M., 134
 Winker, David M., 103
 Winkler, D., 62
 Winkler, Jeffrey D., 131
 Wiscombe, W. J., 62
 Witteborn, F., 191
 Witteborn, Fred, 231
 Wojcik, Rafal, 119, 121
 Wong, 89
 Woo Min, Byoung, 67
 Wood, Byron L., 247
 Wood, Kathryn J., 4
 Woods, P., 250
 Woolverton, J., 84
 Wrenn, Charlie, 170
 Wright, Darrell L., 62
 Wu, Hong, 130
 Wu, Xing-Yu, 153
 Wu, Zhi-Qiang, 51
 Wyles, R. H., 74

X

Xie, Bao-Sheng, 155
 Xie, Jun-Shui, 154
 Xie, Su-Jiang, 154
 Xin, Yi-Mei, 155
 Xing, Cheng, 139
 Xing, Guang Q., 17
 Xu, J., 167
 Xu, Zhen-Hua, 198

Y

Yamashina, Toshiro, 47
 Yan, Jerry, 177
 Yan, Jerry C., 176
 Yan, Michael M.-H., 125
 Yanagihara, Hideto, 47
 Yang, B., 52
 Yang, Ning-Sun, 136

Yang, P., 62, 107
 Yang, Yigor, 42
 Yao, Yong-Jie, 153
 Yarrow, Maurice, 170, 173, 224
 Yau, Stephen S., 181
 Yazawa, K., 104
 Yeakel, Scott, 25
 Yen, Chian-Fong, 41
 Yendeler, Boris S., 55
 Ying, Jackie Y., 38
 Yost, Bruce, 138
 You, C. Y., 211
 You, H., 213
 Young, Corissa, 16
 Young, David F., 123
 Young, John L., III, 117
 Yu, C., 212
 Yu, J. W., 78
 Yu, Joon-Ho, 134
 Yu, Li-Shen, 154
 Yu, Yao-Rong, 154
 Yuan, Fang, 148
 Yuan, Xiu-Gan, 51

Z

Zahorujko, Ian, 178
 Zamudio, J. A., 125
 Zawodny, J. M., 115
 Zelensky, Nikita P., 19
 Zemker, Thomas, 108
 Zeng, Jane, 117
 Zent, Aaron, 246
 Zhan, Hao, 155
 Zhang, G., 53
 Zhang, Qing-Jun, 155
 Zhang, V. S., 169
 Zhang, W., 44
 Zhang, Wen-Zheng, 155
 Zhang, Wenlin, 94
 Zhang, Yan-Ping, 164
 Zhang, Zong-Lin, 164
 Zhao, Lun, 154
 Zhao, Ya-Li, 139
 Zhao, Yong-Qi, 139
 Zheng, Chang-Qiong, 153
 Zheng, Yi, 153
 Zhou, Bryan, 87
 Zhou, Chuan-Dai, 155
 Zhou, Feng-Shu, 164
 Zhou, Kang-Han, 46
 Zhou, Mingfei, 38
 Zhou, Qian-Xiang, 165
 Zhu, Mei-Cai, 140
 Zimmerman, Albert H., 64, 92

Zmuidzinas, J., 239
 Zuber, M. T., 246
 Zurek, W. H., 241
 Zwiener, Jim, 28